

CROP

NEWS

UNIVERSITY OF MINNESOTA
 From the
 Crops System Team
 APR of the 1995
 Minnesota Extension Service

Delayed Planting Effect on Hard Red Spring Wheat Yield

Continuous cold wet weather during April will very likely cause a delay in planting spring wheat. This situation occurred last year, with the heavy rain and snowfall during the last week of April. Last year, some growers got their small grains in before the wet weather and fared well at the end of the season. Hard red spring wheat growers will have to watch the weather pattern carefully for the remainder of April to determine if they want to plant wheat late and suffer potential yield loss associated with delayed planting, or forgo planting wheat all together. Wet weather at the end of April in 1994 pushed the planting date back to about mid-May for many growers in west central Minnesota and the eastern Dakotas. Delayed planting not only causes a potential yield reduction, but also opens up the "black box" of increased potential for scab infection due to later flowering dates, coupled with rainfall which favors the scab infection process.

Planting dates with hard red spring wheat variety trials were conducted at the Waseca, Lamberton, Morris, and Crookston Experiment Stations in the early 1980s. The trials included 12 early and late maturing varieties using three planting dates from early April to early June. These trials indicated that late varieties had higher yield than early varieties when early planting occurred. At the two southern experiment stations, the late maturing varieties continued to yield more at the intermediate planting date, but were all nearly equal at the late planting date

(May 9). From this data it appears that no particular yield advantage would be gained by planting early varieties late in the planting season in southern Minnesota.

At the Crookston and Morris locations (planting dates of May 15, 29, and June 11), early varieties yielded greater than late varieties in 1979. However, in 1980 (planting dates April 28, and May 18, 28), late varieties yielded more than early varieties. It is inconclusive from this research whether planting earlier varieties at late planting dates will consistently out

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Comparing Orthophosphate and Polyphosphate

Changing Plans For Applying Nitrogen Dial U

Nightcrawlers

Spring Rains Encourage Renewed Growth by Plants and Microorganisms

Pruning Trees and Shrubs in Home Landscapes

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Delayed Planting (continued)

perform late varieties. However, it is reasonable to expect some advantages of planting early varieties in northern Minnesota, especially when planting is delayed into May.

Field average at each location for all varieties showed a 1% per day yield decrease when planting was delayed after mid-April in southern Minnesota. The

same rate of yield decline was observed at Morris and Crookston, but began at later dates. The same rate of yield decline began to occur after April 30 at Morris and after May 10 at Crookston.

*Kevin Cavanaugh
Crop Pest Management Specialist*

Comparing Orthophosphate and Polyphosphate

There seems to be some confusion about the effectiveness of various phosphate fertilizers that are being sold in Minnesota. An explanation of some basic facts may help to eliminate some of this confusion.

To begin with, crops absorb phosphorus in the orthophosphate form through the roots. The phosphorus in most dry fertilizers is present in the orthophosphate form. So, after the dry fertilizer dissolves in soil water, the phosphorus is readily available for crop use.

In some liquids, the phosphorus is present in the polyphosphate and the orthophosphate form. In other liquids the phosphorus is in the orthophosphate form. In soils, the polyphosphate converts to orthophos-

phate in a short period of time. This is a chemical and biological conversion that takes 7 to 10 days depending on soil temperature.

These forms of phosphate have been compared in several research trials. When applied to supply an equal rate of phosphorus, both sources have had an equal effect on crop production. One form is certainly NOT 2 to 3 times more effective or efficient than another.

The chemistry of the soil dictates the availability of phosphate fertilizer. This chemistry affects both orthophosphate and polyphosphate in the same way.

*George Rehm
Extension Soil Scientist*

Changing Plans for Applying Nitrogen

The recent string of cold, wet days has caused concern for early spring corn planting. Because of this weather, some plans for the 1995 application of nitrogen fertilizer may have to be changed.

Every corn grower is aware of the importance of early planting. So, it's important that farm operations be adjusted accordingly. Plans for preplant application of nitrogen can be switched to sidedress application instead. Several studies over the years have shown that time of application does not usually have a substantial effect on yield. So, planting dates should not be delayed because nitrogen fertilizer has not been applied.

All nitrogen sources (82-0-0, 28-0-0, 46-0-0) can be applied at sidedress time. If there is no nitrogen loss

during application, all sources should have an equal effect on corn yields. In 1992 and 1993, many corn producers broadcast urea at sidedress time and followed closely with a cultivator. This is an acceptable method for applying sidedress nitrogen and should be given serious consideration.

The use of a starter fertilizer is also a good management practice if nitrogen is used at sidedress time. A rate of 15-25 pounds of nitrogen per acre in the starter is suggested. This nitrogen should be adequate for corn until the sidedress application.

*George Rehm
Extension Soil Scientist*

DIAL U

Dial U is a user-fee telephone diagnostic clinic for calls and samples related to gardening, landscapes, plant diseases, insects and wildlife associated with the home environment. Calls from the public are taken at 1-900-988-0500 weekdays. A flat \$2.99 charge is billed automatically to the phone from which the call is placed.

Nightcrawlers

We have received many calls about nightcrawlers in lawns. Nightcrawlers are very beneficial because they help to reduce thatch and they enrich and aerate the soil. However, large numbers can cause lumpiness in lawns. People should tolerate nightcrawlers whenever possible. If that's not possible, control nightcrawlers by applying diazinon to the turf; this controls about 60% of the population.

Do not use metal rollers to get rid of nightcrawler mounds; this compacts the soil. Instead knock down these mounds with a power rake (also known as a vertical mower). Although early autumn is the best time to power rake, it can also be done in spring when the ground is firm but before hot weather sets in. This is more likely to stir up annual weed seeds in spring, so if lawns are power raked now, follow up with a pre-emergent herbicide.

*Jeffrey Hahn
Assistant Extension Entomologist*

Spring rains encourage renewed growth by plants and microorganisms alike

Early in the season several canker pathogens, including *Cytospora* on blue spruce, release spores which are splashed around to other branches and trees where they cause infections when environmental conditions are favorable. Fortunately for blue spruce, *Cytospora* is a weak canker pathogen and only infects weakened trees. Other common canker pathogens (incidentally, the term canker is used to describe infections on woody tissues surrounded by healthy plant tissue) include *Nectria* on honeylocust and black rot on apple and mountain ash. Galls often damage plants in the same manner as cankers with the most common gall being black knot on chokecherries, cherries, plums, and Mayday trees. Black knot is easy to identify because of the elongate black galls it forms on branches and occasionally the trunk.

Galls and cankers should be removed as soon as possible, preferably before budbreak, and disposed of. Trees and shrubs will have minimal problems with cankers if they are planted on sites conducive for their growth and maintained properly i.e. healthy trees seldom have cankers. Galls tend to be caused by more aggressive pathogens but don't seriously damage healthy trees and shrubs, and can be removed by pruning.

*Cynthia Ash
Assistant Extension Plant Pathologist*

Pruning Trees and Shrubs in Home Landscapes

Many people are currently calling Dial U with questions about pruning trees and shrubs. They're concerned about optimal timing as well as how best to prune specific plants, including "renewing" some that are overgrown or have been let go too long.

Most shade trees aren't terribly fussy about when they're pruned. Oak trees are an important exception; so, possibly, are elms. Pruning oaks or wounding them in any way during April, May or June leaves them vulnerable to the devastation of oak wilt. Wait until July to have them trimmed. If you have an oak tree that's storm damaged this spring, apply wound dressing to all exposed sites as soon as possible.

Refrain from pruning or wounding elms during the growing season if you can. There is some thought that the odor of fresh wounds may attract bark beetles that may be carrying fungal spores that can cause Dutch elm disease.

Maples lose lots of sap in spring if they've been pruned in winter or early spring. Though it may look alarming, it shouldn't harm trees that are pruned properly. To avoid seeing all that sap flow, you can wait until maple leaves are expanded to their full size before pruning.

Wait, too, to prune flowering shrubs that bloom on old wood in May and June. If you prune them right after flowering, they'll make new flower buds for next year. If you prune them in fall or early spring, you'll remove the minute flower buds, spoiling spring bloom. Sometimes when you prune heavily—especially in the case of lilacs—it may take several years before they bloom again.

Hold off pruning junipers, yews, pines and other evergreens until this year's needles start to expand. (More details to follow.)

*Deborah Brown
Extension Horticulturist*

MINNESOTA EXTENSION SERVICE

UNIVERSITY OF MINNESOTA
COLLEGE OF AGRICULTURAL, FOOD,
AND ENVIRONMENTAL SCIENCES

Produced by the Educational Development System, Minnesota Extension Service.

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CROP

From the
Crops System Team
of the
Minnesota Extension Service

APR 18 1995

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Precision Phosphorus Placement Reduces Losses

Movement of phosphorus from crop land to surface waters has been a concern and a popular topic for discussion in recent months. The majority of the phosphorus lost from the landscape is attached to soil particles. Much smaller amounts are dissolved in the water that runs off.

A substantial amount of past research conducted in many parts of the United States has shown that there are management practices that can be used to substantially reduce the amount of phosphorus that moves from the landscape to surface waters. The use of conserva-

The effect of placement of phosphate fertilizer in two tillage systems on loss of phosphorus from a landscape in Virginia.

Tillage System	Fertilizer Placement*	Total P Loss lb./acre
no-till	no fertilizer	.10
	subsurface injection	.24
	surface broadcast	.53
conventional	no fertilizer	1.91
	subsurface injection	2.58
	surface broadcast	4.71

* P_2O_5 rate = 94 lb./acre; Source: Mostaghimi et al.,

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Precision Phosphorus Placement Reduces Losses

Think and Ask Before You Buy Soybean Cyst Nematode

Vegetable Production and Pest Management News

Watch For Seed- and Seedling-borne Diseases

Regulatory News—Vegetable Crops New References for 1995

Recent News Re: Bt-transgenic plants

Climatic Assessment Related to Winter Injury Potential for Alfalfa and Other Crops

Dial U

Minimize Early Spring Lawn Care Tree and Shrub Insects

tion tillage systems in combination with the precision placement of phosphorus fertilizers are two practices that have a major impact on phosphorus loss. The effect of these management practices is illustrated by the data in the above table.

The impact of a tillage system on phosphorus loss is obvious. Therefore, the use of conservation tillage systems such as ridge-till can be very important in reducing phosphorus losses where soil erosion is a major concern.

Placement of phosphate fertilizer below the soil surface also had a substantial effect on loss in both tillage systems. Phosphorus losses were approximately doubled when broadcast applications were compared to banding below the soil surface.

George Rehm
Extension Soil Scientist

Think and Ask Before You Buy

Based on the number of telephone calls and letters received in the past two weeks, it appears that there has been a substantial increase in sales activity for non-conventional and non-traditional products and programs. This increased activity was expected because of the rise in fertilizer prices during the past few months.

These products may have new names. But, the sales claims and sales pitches haven't changed much in recent years. So, if growers are approached by a salesman for a "new" product, it's time to stop and think. Be very cautious and don't spend money if you hear comments like:

"This product is so new that the University doesn't know about it or understand it."

"This product will stimulate soil life."

"This product will release all of the nutrients that are tied up in the soil."

"This product is all natural. So, it can't be harmful to our environment."

"The nutrients in this fertilizer are three times more available than the nutrients in the fertilizer that you buy from the local fertilizer dealer."

Most of the non-conventional or non-traditional products and programs are sold on the basis of testimonials—not fact. The sales literature has little or no data to support the advertising claims. So, when you hear strange sales claims, stop and think.

It's also important to think about costs. For example, some liquid fertilizers sell for about \$2.50 to \$3.00 per gallon. A gallon of a similar analysis from the local dealer might sell for \$1.25. Both products will produce the same yield when applied to the soil. There's no logical reason for buying the higher priced material. Take time to calculate costs before the purchase.

Questions are important. Don't hesitate to ask. There are several good, reliable sources of information. The extension educator, the consultant, and the local fertilizer dealer can all help with decisions about the use of questionable products or programs. Taking time to think and ask could save some farmers a substantial amount of money.

*George Rehm
Extension Soil Scientist*

Soybean Cyst Nematode

Soybean Cyst Nematode—(SCN)—Do you have this problem? It is present in 31 counties and has been reported in MN since 1978. Yet some soybean growers have failed to discover it as a reason for reduced soybean growth and yield. The best indicator of SCN is your farm records showing an increasing corn yield and a flat or decreasing soybean yield. Field symptoms often early in the development of this nematode problem are not evident. Even the reduced growth is difficult to determine and few people carefully dig plants to examine the root for evidence of SCN reproduction. Another early sign to look for is reduced levels of weed management. SCN will be your problem soon if you are in an every-other-year soybean rotation.

One major reason given by growers is that the SCN resistant lines do not yield as well as the susceptible lines, therefore they are not willing to use SCN resistant lines. The yield potential of SCN resistant lines is lower for several varieties if they are planted in non-infested fields, but after several years of testing in Minnesota, it is clear that the resistant lines do out-yield susceptible when the SCN problem is present. The second year of a tillage/rotation study in SCN infested land shows an average of 6.0 B more yield with the

variety Bell compared to the susceptible line Sturdy.

This is true in the five tillage operations being studied and the yield of resistant Bell in 10-inch rows was 4.6 B greater than 30-inch rows.

The final factor to consider is what is happening to the nematode population in these studies. First and to me most important is the large difference in nematode egg levels following the susceptible when compared to the resistant. The resistant soybean plant significantly lowers the nematode population. This I expect will allow a grower to manage SCN levels and make informed decisions about what crop to plant.

Do you have SCN? Should you consider using resistant soybean varieties? SCN is not going to go away, and sooner or later you will have to decide to manage it. I was reminded yesterday that this year is the 150th anniversary of Potato Late Blight. The 1845 epidemic in Europe and the Ireland famine should remind us that just as this disease continues to remain a major potato problem, other crop diseases will not go away either. SCN appears to be similar for the soybean growers.

*Ward C. Stienstra
Extension Plant Pathologist*

Vegetable Production and Pest Management News

Watch For Seed- and Seedling-borne Diseases

As growers get ready for planting, they should be aware of diseases that can be transmitted on seeds or transplants. Many of the diseases that are seed transmitted are bacterial, although some fungi, viruses, and even nematodes can be carried in or on seeds and transplants.

On snap beans, seed-borne diseases include common blight, halo blight, and bacterial brown spot. These diseases can usually be avoided if western-grown, disease-free seed is used, and a proper 2 to 3 year crop rotation schedule is followed. On cabbage and other crucifers, the most important seed-borne disease is black rot, caused by the bacterium *Xanthomonas campestris*. This disease can be devastating, especially if it becomes wide-spread during the seedling stage. Crowded seed beds provide ideal conditions for spreading the bacterium, thus seed lots should be entirely free of bacteria prior to planting. Sanitation and crop rotation are also important for managing black rot on crucifers.

Angular leaf spot and watermelon fruit blotch are the seed-borne diseases to watch out for in cucurbits. Angular leaf spot causes localized spots on the leaves which are restricted by major veins, giving them an angular shape, hence the name. Watermelon fruit blotch also causes lesions on the leaves of watermelons and other vine crops. The first symptoms will appear as dark, water-soaked lesions on the lower surfaces of the cotyledons. On peppers, bacterial spot is probably the number one concern in terms of seed-borne dis-

eases. Once started, this disease is very difficult to control and can wipe out an entire crop if conditions are favorable, so every effort should be made to keep it out of the planting. Only certified disease-free transplants should be used, and plants should be inspected closely for symptoms of bacterial spot prior to planting. Virus diseases, including cucumber mosaic virus, also can be transmitted on pepper seedlings. Although these viruses generally survive in weeds, and not in pepper seed, they can infect seedlings prior to transplanting. The leaves of infected plants will be somewhat distorted and wrinkled, and the plants may appear slightly stunted. On tomatoes the diseases to look for are bacterial spot, bacterial speck, bacterial canker, and the tomato spotted wilt virus. Bacterial canker is an especially difficult disease to control because symptoms of the disease take up to 30 days from the time of infection to appear. So by the time symptoms show up, the plants may already be planted in the field.

In general the methods for controlling seed and transplant borne diseases include purchasing seeds or transplants from a reputable source, and if available, purchasing planting stock which has been certified as disease free. This is one area where a little extra money spent at the beginning may be well worth it by the end of the season. It is also important to closely inspect seedlings for signs of disease, no matter what the source, so that problems can be detected prior to planting. (Info. provided by Darin Eastburn, Univ. of Illinois.)

Frank Pflieger
Extension Plant Pathologist

REGULATORY NEWS — Vegetable Crops

In late March the US EPA approved registration of the pyrethroid insecticide Warrior (lambda-cyhalothrin, produced by Zeneca) for use on broccoli, cabbage, head lettuce, bulb onions, garlic, tomatoes, and tomatillos. Warrior is a Restricted-Use pesticide; only certified applicators may purchase or apply it. This product contains the same active ingredient as Zeneca's Karate, an insecticide that many vegetable growers have read about in research reports concerning trials in sweet corn and other crops. Warrior is the trade name that will be used by Zeneca for lambda-cyhalothrin's registrations on food crops. Expect Warrior to work well against many Lepidopteran pests (loopers, cabbageworms, ear-

worm, corn borer, and some armyworms, for example); see product labels for additional target pests. Required pre-harvest intervals (minimum number of days between last application and harvest) are 1 day for broccoli, cabbage, and head lettuce; 14 days for bulb onions and garlic; and 5 days for tomatoes and tomatillos. Warrior is not to be used on cherry tomatoes if mature fruits will be less than 1 inch in diameter. Check the product label for further details and restrictions. (Info. provided by Rick Weinzierl, Univ. of Illinois; contact Bill Hutchison; we are still waiting for a label)

Bill Hutchison
Extension Entomologist

New Fruit & Vegetable References for 1995

A new practical guide to insect management, *Vegetable Insect Management — With Emphasis on the Midwest*, is scheduled for availability in June. A pre-publication price break is offered for early orders: \$35.00 softcover or \$47.00 hardcover. (Retail prices will later be \$40.00 and \$54.00, respectively.) This 190-page book is practical and targeted to Midwest pests and conditions; it should be a very valuable reference for Illinois vegetable producers. To order, contact Meister Publishing Company, 3733 Euclid Avenue, Willoughby, Ohio 44904-5992. Call 1-800-572-7740 to order by phone.

Identifying Diseases of Vegetables is a 62-page publication filled with excellent photos of vegetable disease symptoms. It's available for \$10.00 from the Publication Distribution Center, College of Agricultural Science, 112 Agricultural Administration Bldg., Pennsylvania State University, University Park, PA 16802.

A few recent publications on strawberries should be useful to many Minnesota growers. One is *Integrated Pest Management for Strawberries* (copyright 1993), published by the University of California. This 142-page publication covers insect, weed, and disease management and contains many useful illustrations and tables. Although it focuses on California production systems and pests, much of its content is applicable in

the Midwest. To order, send \$30.00 per copy to Publications, Division of Agriculture and Natural Resources, University of California, 6701 San Pablo Ave., Oakland, CA 94608-1239 (phone 510-642-2431).

Another strawberry IPM publication is *Integrated Pest Management for Strawberries in the Northeastern United States*. This 52-page publication is remarkably thorough and very easy to read and understand. Order it for \$7.00 per copy from: Publications Office, Massachusetts CES, Thatcher Way — Cottage A, University of Massachusetts, Amherst, MA 01003.

Additionally, two publications from Ohio State University should be useful. One is the *Ohio Strawberry Manual* (\$5.00); the other is *Insect Pests of Strawberries* (\$1.50). A limited number of copies are available from Jeff Kindhart, Department of Horticulture, University of Illinois Dixon Springs Agricultural Center, Rt. 1, Box 256, Simpson, IL 62985. You can also order these publications from the Publications Office, Ohio Cooperative Extension Service, The Ohio State University, 385 Kottman, 2021 Cofey Rd., Columbus, OH 43210-1044 (Ph. 614/292-1607).

Bill Hutchison
Extension Entomologist

RECENT NEWS RE: Bt-Transgenic Plants

The U.S. Environmental Protection Agency has approved, for the first time, a limited registration of a genetically engineered pesticide procedure called plant-pesticides for potatoes, corn and cotton. Plant-pesticides are produced when genetic information necessary to make an insecticidal substance is taken from a type of bacterium, *Bacillus thuringiensis*, or B.t., and transferred to a crop plant. Transfer of this genetic material into the plants enables them to produce the pesticidal substance protective against certain insects.

The EPA believes that plant-pesticides can offer an opportunity to reduce the use of conventional pesticides and generally result in less risk to public health and the

environment. The purpose of these limited registrations is to allow the companies to produce large quantities of corn and cotton seed and seed potatoes to allow this technology to move closer to commercial use. The initial plant pesticide registrations limit the companies to produce seed for corn and cotton and seed potatoes. The registrations expire unless renewed by EPA: potatoes on March 1, 1996; corn on Sept. 15, 1996; and cotton on March 15, 1996. Seed production is limited in acreage and restricted to certain states. (Info. provided by Univ. of Illinois)

Bill Hutchison
Extension Entomologist

Climactic Assessment Related to Winter Injury Potential for Alfalfa and Other Crops

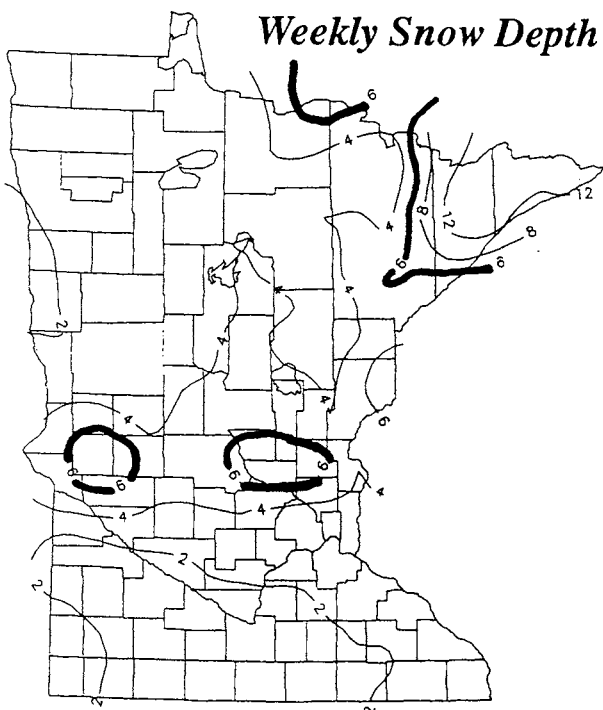
This winter has proven to be one of the mildest in recent years with average temperatures for the November through March period ranging from 4 to 8 degrees above normal in many Minnesota counties. Unfortunately, there have been brief climatic episodes which may have contributed to an increased risk of winter injury to alfalfa and other crops:

- 1) October and November precipitation was generally above normal (August through November in many locations in Southern Minnesota), along with above normal temperatures such that the normal hardening off period (onset of dormancy) for crops was somewhat inhibited.
- 2) Abnormally low temperatures occurred on three separate occasions this winter, January 2-9, February 10-16, and February 28-March 3. During these times overnight minimums of -10 to -30 degrees were recorded. The January and mid

February spells of low temperatures occurred when snow cover was very shallow or totally absent in many areas of southern Minnesota. See the attached maps showing the pattern of regional snow cover. In general the area south of a line from Lac Qui Parle in the west, to Washington County in the east, experienced shallow and inconsistent snow cover all winter long.

- 3) Freezing rain and drizzle during February caused ice sheets to build up across some southern Minnesota counties. This ice sheeting inhibits the normal exchange of gases between the soil and the atmosphere and can be conducive to winter injury. Those field locations most susceptible to ice sheeting such as low lying and shaded areas should be checked this month more carefully for signs of winter injury.

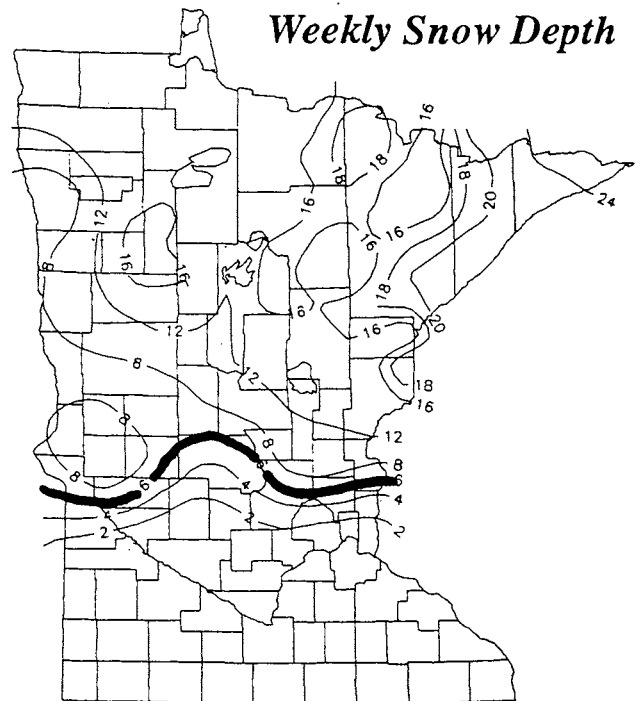
For 8 am, January 11, 1995



Values are in inches

Snow depths are generally measured on grassy, protected areas
 Data: National Weather Service, Department of Natural Resources
 Prepared by: State Climatology Office, DNR - Division of Waters

For 8 am, March 2, 1995



Values are in inches

Snow depths are generally measured on grassy, protected areas
 Data: National Weather Service, Department of Natural Resources
 Prepared by: State Climatology Office, DNR - Division of Waters

Climate/Continued

- 4) Soil temperatures less than 15 degrees F are conducive to winter injury of alfalfa. During February, the lowest soil temperatures of the winter were recorded at university field research locations. These data are summarized below:

*Lowest 4 inch depth soil temperatures recorded for winter 1994-95 (nearly all date to mid-February cold spell).
Number of days with temperatures below 15 degrees.*

Becker	27	Princeton	11 (4)
Cedar Creek	22	Roseau	25
Crookston	27	Rosemount	12 (4)
Grand Rapids	32	Staples	14 (2)
Lamberton	9 (10)	Waseca	9 (5)
Morris	18	Westport	8 (6)
Park Rapids	20		

Given our winter conditions this year, we have potential for damage in Southern Minnesota (south of line drawn between Mora in east and Fergus Falls in west) from three weather conditions:

- 1) damage from exposure to severe cold temperature in January, February or March
- 2) smothering from ice sheets produced in February
- 3) alternate freezing and thawing during March and April

Cold Exposure From Severe Cold Temperature

If the crowns and roots of alfalfa are exposed to temperatures between 15 and 5° F or lower (-9.4 to -15°C) for 2 weeks or longer, damage can occur. Potential damage will be winter injury, which means plant damage will range from dead plants after spring thaw to plants with partially injured crowns to completely healthy plants. The complete extent of damage cannot be determined until after healthy plants reach 6 inches of spring growth, probably early May in southern Minnesota this year.

We don't expect extensive damage from extremely cold temperatures experienced in January and February. However, alfalfa broke dormancy in Southern Minnesota during late March and was exposed to record low temperature April 3. New alfalfa growth will not tolerate extreme cold temperatures. The key to damage will be the temperature exposure and the duration of exposure.

Alfalfa plants with a lower fall dormancy index '4' will grow taller than plants with '2's or '1's. Fields not harvested last fall will have more insulation than those cut late and close to ground.

Smothering From Ice Sheets

Ice sheet damage is related to the duration of ice sheets. Generally solid ice for 2 weeks or longer can cause smothering; plants die from exposure to excessive build-up of carbon dioxide. Dead plants will be obvious. Dig plants to determine root decay, soft texture and yellow to brown color.

Alternate Freezing and Thawing

Alternate freeze-thawing of soils causes alfalfa, red clover or birdsfoot trefoil plants to heave, physically lifted out of the soil. I would expect alfalfa to be more susceptible to heaving than red clover and birdsfoot trefoil. Also, stands with grasses mixed with these legumes are less susceptible to damage. Normally we don't experience this type of damage in Minnesota. However, damage is possible this spring, especially in soils saturated with water last fall.

Assess the Viability of Your Stands

Walk your alfalfa fields to assess potential damage. First year hay stands show have 10-15 plants per square foot and older stands at least five (5). Early in the spring, you can determine if regrowth is coming from all plants. Dig a few plants to observe the health of the roots. White color and firm texture is a sign of excellent health. Discoloration and/or soft texture is a sign of decaying roots. Fields with varying degrees of plant damage should be monitored until plants reach at least 6 inches of regrowth. Damaged plants may recover briefly using food reserves within the crown, but do not have live root tissue to move water and foot to the plants' top. If plant growth is active at a 6-inch height and root texture is firm, survival is expected. Damaged stands should be harvested late; fifty (50) percent bloom to full bloom to allow for complete recovery.

Winter Injury of Other Perennial Forages

Moderately-hardy perennial forage crops, red clover, orchardgrass and tall fescue could be damaged. When alfalfa is injured from excessive cold exposure, other moderately hardy species can also be damaged. Orchardgrass and tall fescue will tiller extensively late in the spring if cool, moist conditions persist through the spring. Red clover injury will be similar to alfalfa.

Reseeding Options

Old alfalfa fields (2 years old or older) will be the most difficult stands to reseed to alfalfa; autotoxicity - decaying alfalfa plants kill new seedlings. We recommend changing to another crop in these cases. If reseeded is done, however, early tillage to speed the de-

cay of old plants followed by a 3 week delay in planting and using a pre-plant incorporated herbicide (EPTC is best) is your best reestablishment technique. However, working the soil and delaying seeding increases your risk of insufficient moisture for successful establish-

ment. Use your best judgement. Younger stands (2 years or less) will not be expected to carry autotoxicity problems.

Neal P. Martin
Extension Agronomist

Mark Seeley
Extension Agricultural Climatologist

DIAL U

County Agents: Please Alert Master Gardeners to the Following Items

Minimize Early Spring Lawn Care

Our perverse “spring” weather has would-be gardeners rattled. March was pretty mild, then April began on a bitterly cold note. Deciding when — or whether — to move ahead with spring garden and yard care activities remains a challenge.

Melted snow left behind evidence of neighborhood dogs along with other debris blown in by brisk winds, including leaves that weren’t raked up last autumn. You might even find some patches of snow mold, where the grass looks discolored and matted.

It’s important to rake snow mold mats to break them up and expose grass to fresh air and oxygen. It’s also a good idea to rake up dog droppings as soon as you can. But until the soil feels solid — not squishy — under foot, keep walking on it to a bare minimum. Walking on soft wet soil makes it more compact, reducing drainage and making it more difficult for roots to grow well.

If sand that was used to provide traction last winter has built up in the grass along your road, sidewalk or driveway, rake it out as best you can. Stand on the hard surface and rake towards you so you can sweep the sand up for re-use next year.

If the sand was mixed with ice-melting salts, be sure to really soak areas of the lawn where it was deposited. This helps dilute salt already in the soil, perhaps lessening the potential damage to grass. Soaking is also the first step if you need to overseed, should that grass fail to green up along with the rest of your lawn.

Deborah Brown
Extension Horticulturist

Tree and shrub insects

Questions have come up recently about treating now to prevent insects (e.g., sawflies and caterpillars) that were problems last year. Despite the temptation, it’s too soon to spray in early spring. Instead, it is best to wait and control insects when they’re first found on plants. First, make sure you have the insect identified. From that information, you will know about when the insect is expected to be out (different insects come out at different times of the year). From that, start to monitor your trees or shrubs about one to two weeks earlier than the pests are expected. By anticipating them, you should be able to find them soon after they are actively feeding on the plant. You can spray them if their numbers warrant it. By spraying when the insects are small, they are easier to kill and you minimize damage to plants.

Jeffrey Hahn
Assistant Extension Entomologist

MINNESOTA EXTENSION SERVICE

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CROP**NEWS**

From the
Crops System Team
of the
Minnesota Extension Service

Does Black Cutworm Trapping Run in Your Veins?

The Integrated Pest Management (IPM) program is looking for a few good black cutworm trappers. If you're looking for something new to talk about over morning coffee, need an excuse for a morning walk, don't like uncertainty in life, or just want to marvel about moths that have traveled 1500 miles to choose your farm to raise a family, call me (612-624-7436) to help us out.

Why trap black cutworms?

I hate to dispel a rumor but it's not for food or their pelts! Widely regarded as the most destructive cutworm, this critter wisely overwinters in Texas, northern Mexico, and the Gulf Coast only to migrate northward each spring. These migrations pose a slight but perennial threat to Minnesota crops. Fortunately, our geographic position at the northwest corner of their migratory route tends to diminish the risk for Minnesota. Over the last 10 years major outbreaks occurred in 1985 and 1986 with a few minor problems since then. Our good fortune, however, may not hold in 1995...and that's why the black cutworm monitoring project could be extremely valuable.

How are black cutworms flights monitored?

Migratory flights into Minnesota are easily detected with pheromone traps. These traps contain a lure laced with a sex attractant (pheromone) that is released by females looking for mates. Male black cutworms, attracted to the pheromone (sex scent) lures in these traps, are captured on a sticky trap bottom. Captures of over 10 moths in a 2-night period indicates a significant influx of male and female moths into the area. Not only do the traps indicate where

a potential problem might appear but when it will show up and which fields are at risk

Fields at risk are those with abundant residue and weed growth when the flight arrives. Young cutworms begin attacking crops about three weeks after arrival, depending on temperatures.

How can I obtain information about black cutworm flights?

Solution #1. Read this newsletter.

The Minnesota Extension Service IPM program, with supplemental funding by Pioneer and DowElanco, is

Highlights...April 7, 1995

Does Black Cutworm Trapping Run in Your Veins?

Value Added Products '95

Micronutrients Not Needed on Manured Fields

Seed-Placed (A.K.A. POP-UP) Fertilizer With Corn

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Black Cutworm/Continued

creating a black cutworm monitoring network. Up to 120 cooperators will monitor traps from April 1 to May 25 and report their captures to me. Results will be summarized weekly in *Minnesota Crop News* and on DTN. If you're looking for exciting morning conversation about what you caught and want to help us out, call me. We're still looking for a few good trappers and we'll provide everything you'll need (except time and energy).

Solution#2. Buy your own trap.

Black cutworm pheromone trap kits can be obtained from two sources:

Great Lakes IPM
Vestaburg MI
(800) 235-0285

Pest Management Supply
Hadley, MA
(800) 272-7672

Individual trap kits cost approximately \$12. Call for specific prices.

Ken Ostlie
Extension Entomologist

Value Added Products '95

Value Added Agricultural Products-95 is scheduled for Montevideo on Thursday, July 6, from 9:00 AM through 5:00 PM at the High School and Training and Community Center.

It is designed for ag producers and agri businesses in Minnesota. New and innovative value-added ag products and business ideas will be featured to boost income. Over 40 value-added seminars will be taught by successful entrepreneurs, exploring ideas to ac-

complish value-added processing and to bring more jobs and community development. In addition, there will be over 40 exhibitors. Come and spend a day exploring new opportunities for value-added products. Contact Jack Morris, Pope County Extension Educator or Roger Larson, Chippewa County Extension Educator for more information.

Roger Larson
Chippewa County Extension Educator

Micronutrients Not Needed on Manured Fields

University of Minnesota recommendations regarding micronutrients are not widespread across the state. Years of research have resulted in many non-responsive yield trials. However, based on crop to be grown, soil type, and/or soil test values, there are situations where micronutrient additions will result in additional yield.

Having said this, there is one management factor that should over-rule these situations. This is when manure has been applied to a field within the past couple years. Although the nutrient concentration of sulfur, zinc, boron, etc., may seem relatively low according to a laboratory analysis or a "table" value, the rate at which manure is applied to a field along with the small amount of micronutrients needed by crops eliminate the need for commercial micronutrient fertilizers.

A common perception held by many people is that manure creates "imbalances" in the soil, as soil P and K test values may get exceptionally high. These high soil test values **do not** create a micronutrient shortage because as the manure supplies the P or K to build the soil test levels, the manure is also supplying micronutrients, such as zinc.

For dairy producers that are in regions where sulfur and/or boron are a concern for their alfalfa fields, applying manure as a preplant application to these fields or onto the corn in the year before seeding to alfalfa will supply these nutrients for a couple years of the stand. After this time, one may need to topdress commercial S and/or B if manure is not being topdressed to these fields.

Mike Schmitt
Extension Soil Scientist

Seed-Placed (A.K.A. POP-UP) Fertilizer with Corn

Every spring the question arises as to how much fertilizer can one place **with** the seed. The answer is not as straight-forward as the question. First, the amount of N and/or K are the nutrients that affect this rate. As a

general rule-of-thumb, the University of Minnesota would not recommend more than 5-10 lbs. of (N + K₂O) to be placed with the corn seed.

However, certain fertilizer products should be avoided completely, such as ammonium thiosulfate, any boron-containing fertilizers, and any urea-containing fertilizers, which can include UAN-28 and 9-18-9 products.

The potential for seed/seedling burn (or desiccation) is a function of the fertilizer product, rate, soil texture, and the soil moisture content—the drier the soil, the greater potential for burn. Because we cannot predict

the soil moisture content of the soil, the University of Minnesota's guidelines on this issue are somewhat conservative. While you or your dealer may commonly use higher rates than the guidelines state, in most years you may be safe simply due to soil moisture conditions. However, one year of disaster due to poor stands is not worth the risk of the higher rates.

*Mike Schmitt
Extension Soil Scientist*

CRP Decisions

Conservation Reserve Program (CRP) contract holders have many pending decisions concerning the future of CRP acres. In Minnesota, 20,053 contracts covering 1,484,502 acres expire in 1996, 1997 and 1998. Federal policy makers are discussing options for extending contracts for some or all of the contracts, perhaps at a lower compensation rate and perhaps targeted at the most environmentally sensitive acres. However, in the absence of Federal action, the contract holders will be faced with management of post CRP acres.

Surveys of contract holders indicate that if extended CRP contracts are not available, they would return the majority of those acres to crop production. However, returning those acres to crop production will not be an easy task. Farmers will need to identify and establish locations for grass water ways, contours and buffer strips to control soil erosion. Plant seedbed establishment will need to occur while not contributing to soil erosion. Fields will need to be leveled so they can be planted, cultivated and harvested. Fertility, insect and weed control issues will be confronted.

Certainly, bringing CRP acres into crop production will require careful management.

One of the first challenges will be elimination of vegetation which will compete with crop growth. A combination of herbicide and tillage will likely be necessary. For non-selective herbicides to be most effective, early planning will be important. Mowing the CRP the summer previous to crop production will encourage late summer and early fall growth. Non-selection herbicide application in the early fall to actively growing plants will be most effective.

Many CRP fields are not possible to mow or ground apply herbicide due to ten years of pocket gopher activity. These fields may need to be disked to level the mounds constructed by the pocket gophers.

Dealing with the biomass, or the accumulated plant growth will be the next challenge. The biomass ultimately will be beneficial to the soil. However, that biomass can complicate seed bed establishment and soil nutrient availability. The planted seed will need to have contact with the soil. Whether no till or full width tillage practices are employed, the seed zone must be cleared of biomass.

Nitrogen is required for biomass mineralization or breakdown, resulting in the available soil nitrogen unavailable to the crop. The mineralization process is speeded with increased incorporation of biomass into the soil.

Crop selection is the next challenge. There is no clear "best crop" for the first year post CRP crop production. Corn may have the best possibilities for establishment. However, the unavailability of nitrogen due to biomass mineralization may require starter fertilizer. In addition, soil insects such as wireworm may be a problem. Soybeans may be a crop to consider in first year post CRP production. However, weed pressure and weed control costs may be a problem. Small grain, such as wheat and oats, may yield reductions due to nitrogen unavailability. However, small grains have lower input costs and offer more options for perennial weed control due to early harvest.

The best recommendation may be to view the first year of crop production following ten years of CRP as a transition year. Weeds, insects and biomass all must be managed during this transition year. Input costs may be high and yields will be uncertain.

To provide answers to the many first year post CRP crop production issues, the Minnesota Extension Service will be conducting demonstration research on CRP land in Lincoln County beginning in 1995.

*Bob Byrnes
Lyon County Extension Educator*

Changes

As we get ready for the 1995 cropping season, it's a good time to reflect on changes that have taken place in production agriculture in the past several years. Some major changes that come to mind are:

- ✓ More acceptance of precision placement of fertilizer.
- ✓ Better equipment to more accurately monitor and deliver fertilizer.
- ✓ Adoption of Best Management Practices for use of nitrogen fertilizers by a large majority of Minnesota farmers.
- ✓ Use of herbicides that are applied in ounces per acre instead of quarts or pints per acre.
- ✓ Development of herbicides that are targeted for specific weeds, especially perennial weeds.

- ✓ Development of grid soil sampling as a tool for measuring variability in nutrient levels in fields.
- ✓ Development of equipment that provides for variable rate application.
- ✓ Crops which are resistant to certain herbicides.
- ✓ Biological approaches to insect control

All of these changes have focused on improved profit and a concern for environmental quality. We can be sure that there will be many more changes in the years ahead and that changes will come more rapidly than they have in the past. It will be a challenge for many Minnesota farmers to adopt changes. But, change is necessary if agriculture is to remain as the number one industry in Minnesota.

*George Rehm
Extension Soil Scientist*

Small Grains Spring Field Work

Spring tillage normally does not produce a good seed bed for spring planting. However, because of last fall's weather conditions, many farmers in northwest Minnesota were unable to complete their fall field work; what are their options this spring?

Use of the chisel plow is the only realistic option when it comes to tillage. However, where there is heavy stubble or the remains of the 1994 crop, the field will probably have to be burned to warm up the soil and speed up drying. Burning is not normally recommended, but may be necessary to get a crop seeded this year in some fields.

As a word of caution, farmers in extreme northwest Minnesota should obtain an "Agricultural Burning Permit" from their local fire chief or township fire warden. This permit allows a farmer to burn crop residue for a 30-day time frame. If the field has heavy ruts, disking can be done to fill in the ruts, but will cause consider-

able soil compaction. Once the disking is completed to fill in the ruts, it can be followed with the chisel plow.

In other cases, some fields should be lightly chisel plowed to "open up" the soil and speed drying and then followed by a heavy chisel plow operation. Trial and error may be the only way to go on some fields this spring with tillage.

If nitrogen was not applied last fall, the use of urea is the best option. The timing of the urea application will be determined by rainfall and soil moisture. If the soil stays very wet, delay the urea application until after planting but before the tiller stage of the small grain. If the weather turns dry, the urea application can be applied before planting and the planting operation will incorporate the fertilizer.

*Curtis W. Nyegaard
Kittson County Extension Educator*

High Oil Corn

Some corn companies have high oil corn (HOC) blends available for the 1995 growing season. Oil content of normal commercial corn hybrids is generally about 4 to 5%. Grain oil content of HOC blends is 6 to 7%. This approximately 2 percentage points change in oil content is a 50% increase in oil level.

Why might increased levels of oil in grain be important? Oil is higher in energy than protein or starch and therefore a higher oil level might be beneficial in live-

stock diets requiring high caloric levels, such as diets for poultry, swine, and high producing dairy cows.

Feeding Trials

Results of feeding trials with broilers, published in 1987, showed faster weight gain with less feed required per weight gain with diets containing HOC compared with normal corn. From swine trial results published in 1988, diets with corn containing 7% oil resulted in 11% faster daily gain and 6% greater gain/feed ratio compared with

diets with corn with 3.5% oil. Advantages for HOC that may appear in advertisement literature are based on calculations rather than actual feeding trials and may or may not result in similar changes in animal performance. Interest in HOC will surely generate more feeding trials soon.

HOC Blends

Breeders have been successful in their selection for high oil (HO) in corn and have raised oil levels up to 21% of the kernel dry weight. At the same time, grain yield decreased significantly. Recent breeding efforts have resulted in corn lines (hybrids or synthetics) with an oil level of 6 to 7%. Apparently these HO lines are not the best agronomically. Therefore, the HOC blends that are currently available are blends between good corn hybrids that are male-sterile and the HO line that is male-fertile. In growers' fields, pollination will be a cross between the two parents with resulting grain that is higher in oil. The mixture of these two types is 92% of the male-sterile hybrid and 8% of the male-fertile high oil line. That is, only 8% of the plants in the growers field will produce pollen. This should be sufficient for completely successful pollination of all silks on the 92% of the plants which will not produce pollen.

Yield Potential

Yield trials of several corn hybrid blends at the University of Wisconsin during 1993 and 1994 gave the fol-

lowing results. In 1993, the three highest yielding HOC blends yielded an average of 93% of their male-fertile versions of the same hybrids. Oil contents ranged from 6.4 to 8.3% for the high oil blends. In 1994, the five highest yielding HOC blends averaged 100% (97 to 104%) of their male-fertile versions with oil percentages ranging from 6.7 to 7.5%. These results show yield potential of a HOC blend to be as good as the yield of the same hybrid in its fertile condition. However, the results also show some hybrids in these HOC blends do not yield as high as their male-fertile counterparts. In both years, oil content of the HOC was about 2 percentage points higher than in the male-fertile hybrids.

Value of HOC to Corn Growers

Corn growers with livestock, especially poultry, swine and high producing dairy cows, can use the HOC grain to raise the energy levels of diets. Improved animal performance in rate of gain and feed efficiency should be expected. Cash grain producers might receive a price premium when selling, but they should check with their grain buyer for possible market and price. If growers store HOC grain and expect to market it as HOC, they would need to store the grain separately to preserve the purity of the HOC.

*D. R. Hicks
Extension Agronomist*

Corn Row Spacing

There's been a lot of interest in narrow rows for corn. Farmers growing sugarbeets have been growing corn in 22 inch spaced rows for several years and the practice is quickly being used by other corn and soybean growers. One of the advantages of a common row spacing for growing corn and soybean (and sugarbeet) might be equipment inventory, particularly for growers with fewer than a total of 700 acres of corn, soybeans, and sugarbeets.

We have studied row spacings and plant populations for corn at the Southern, Southwest, and West Central Experiment Stations for the past three years. Even though yield levels have varied from 50 to 200 bushels per acre at the three locations during the 1992, '93, and '94 growing seasons, we have obtained a consistent yield increase in 20 inch compared with 30 inch spaced rows. Results are given in **Table 1**, page 26, averaged across three (3) hybrids and four (4) plant populations. All hybrids tested produced higher yields in 20 inch rows and plant populations of 30,000 plants per acre produced the highest yields in all three row spacings. The yield advantage for 20 over 30 inch spaced rows was 7.5% at Waseca, 7.1% at Lamberton, and 7.8% at Morris.

Ridge till systems don't allow for narrow row corn and soybean production. However, ridge tillers are modifying planters to plant double or triple rows of corn or soybeans on the ridges which are spaced 30 inches (or more) apart. We conducted twin and single row studies of both corn and soybeans at the Southern Experiment Station in 1983-84. Single rows were spaced 30 inches apart and twin rows were 7 inches between rows and 30 inches between centerlines of the twin rows. Results are given in **Table 2**, page 26. There was no difference in corn yields for corn planted in one or two rows, but soybean yields were 6.4% higher in twin rows compared with single rows. In this same study, we also had soybean single rows spaced 20 inches apart. Soybean yields for 20 inch spaced rows were 4 bushels higher than for twin rows (45 versus 41 bu/a).

Rows narrower than 30 inches will produce significantly higher corn and soybean yields as shown in **Table 1**. And soybean yields can be increased for ridge till grown soybeans by planting two or more rows on the ridge (**Table 2**).

Continued on page 26

Corn Row Spacing/Continued

Table 1. Corn yields for three row spacings at three locations in Minnesota, 1992-94.

Row Spacing	Southern Exp. Stn., Waseca	Southwest Exp. Stn., Lamberton	West Central Exp. Stn., Morris
Inches	----- Bu/A -----		
10	155	137	116
20	157	136	115
30	146	127	106

Table 2. Corn and soybean yields grown in 30 inch spaced twin and single rows at Waseca, Minnesota, 1983-84.

Number of Rows	Corn	Soybean
	----- Bu/A -----	
One	114	39
Two	115	41

D. R. Hicks
Extension Agronomist

Livestock Manure Utilization Statement

Recently, livestock producers have been requesting to know how to handle excess manure that results from their manure management planning in the feedlot permitting process with MPCA. (For details please refer to "Running Your Feedlot" and MPCA publication). If a farm's feedlot plan results in a shortage of available cropland for proper manure management, the MPCA will not issue a feedlot permit. A good alternative to relieve this situation is to have a neighbor utilize the excess manure.

If a neighbor's land is used for manure application, a signed statement giving the farmer permission to apply manure is required. Also, an aerial photo (ASCS map) designating the cropland should be included with the signed statement in the feedlot permit application. The following points should be considered in drafting the manure utilization statement.

- 1) Designate fields for manure application — if possible based on a soil test
- 2) Manure application rates should not exceed crop nutrient requirements — if possible based on manure test
- 3) Best management practices and setback distances should be observed
- 4) Due to high fertilizer costs this spring, the relative value of manure has improved — farmers may be willing to pay for manure

If you are applying for a feedlot permit from MPCA, you must include a completed application and if needed, a signed manure utilization statement by your neighbor. An incomplete application can result in processing delays of the permit.

Tim Wagar
Jerry Tesmer
Extension Educators

White Pine Blister Rust Can Be Easily Controlled

White Pine Blister Rust can be controlled in many areas of Minnesota in spite of high levels of infections. We have successfully reduced the losses to blister rust by removing the new infections each year. Most new infections will be restricted and easily removed by simply cutting out the infected part of the stem. In this way almost every infection will be detected and removed with no further growth of the rust fungus. The inspections should take place in spring when new infections become evident. Because of the bright color of the new infections it is possible to detect almost 100 percent of the infections including all the new infections plus previous year infections which are still quite limited and

easily removed. Even if some infections are missed the inspection the following year will locate missed infections which are limited in size and easy to remove.

It is surprising how easy it is to detect new infections and remove them. Over a period of a few years the disease can be completely eliminated or greatly reduced.

If the trees are young no ladders are needed and each subsequent year fewer infections will need to be removed. In a few years blister rust is hard to find on any of the trees. This is also a good time for corrective pruning.

D. W. French
Professor

Turf

The fungicide named "Eagle WSP" has received federal registration. It is available in water-soluble packets and is suggested to be applied at two week intervals. The active ingredient is mycobutanil, a DMI-type sterol inhibitor fungicide. It has a wide range of diseases on the label and is targeted for Dollar Spot and Brown Patch. It has excellent performance on Dollar

Spot and good control of Brown Patch. Remember this is a Sterol type and similar to Banner, Bayleton, Rubigan and Sentinel. **Do not** rely exclusively on this type of product for disease control, it can increase the risk of resistance to these fungicides.

Ward C. Stienstra
Extension Plant Pathologist

Dial U

County Agents: Please Alert Master Gardeners to the Following Items

Uncovering Roses and Other Flowers

Our early mild weather inspired a flurry of calls to Dial U about uncovering roses, flowering perennials and spring-flowering bulbs. We were constantly reminding people that it was only mid-March, typically far too early to count on consistently warming temperatures.

Considering our changeable weather, it seems there's an element of luck to picking the right time to remove mulching materials. If you're too early, plants may be badly damaged by cold. On the other hand, if you wait too long, tender new growth may mold and die under the mulch.

In the Twin Cities area we recommend uncovering (and lifting, if they were buried) all tender roses right around April 15th. You can begin the process of removing mulch earlier, though, as it loosens and thaws. If you're in Greater Minnesota, begin the process one week earlier for every 100 miles you live south of the Twin Cities and at least one week later for every 100 miles north of the cities.

As for bulbs and perennials, it's best to remove their mulch in stages. If you decide to uncover them quite early, don't rake the straw or leaves away. Leave them between plants so you can cover them again quickly, should the need arise.

Don't be afraid of snow falling and collecting on bulbs and perennial foliage. The snow actually insulates and protects them against extreme cold. Though its weight may bend them down, they generally realign themselves within a few days after it melts, and are none the worse for the experience.

Deborah Brown
Extension Horticulturist

Timely Plant Pathology Tips:

* Prune fruit trees before new growth begins. Check closely for cankered branches (cankered bark will be lighter or darker in color than the normal bark in cankered areas, and often appears sunken). Remove cankered branches several inches below the canker margin at a good pruning spot. Don't leave stubs. Don't remove the branch collar.

* Keep disease to a minimum in the vegetable garden this year by allowing for good air circulation, ie. don't place plants too close together. Try to water only at the base of the plants and thoroughly to limit irrigation frequency.

* Don't throw kitchen scraps directly into the garden. Compost them properly to prevent the introduction of plant pathogens or dispose of them.

* Don't prune oak trees between April 15 and July 1. The risk of getting oak wilt during this period is very high.

Cynthia Ash
Assistant Extension Plant Pathologist

Tick Samples

Our first tick sample was received the last week of March and was identified as an adult female blacklegged tick. Blacklegged ticks, formerly called deer ticks, are potential vectors of Lyme disease. Although it may feel too cold for ticks to be active now, recent research has demonstrated that blacklegged ticks can be active at and above 4°C (about 39°F). Take proper precautions to avoid ticks, including carefully examining yourself for ticks if you have been out in known tick areas at and above 39°F. See FO-1013, *Minnesota Ticks and Their Control*. (Note: this publication is in the process of being revised and should be available in about one month.)

Jeffrey Hahn
Assistant Extension Entomologist

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MINNESOTA

Vol. 1
No. 3

CROP

ST. PAUL From the ~~Faculty~~
Crops System Team
of the
Minnesota Extension Service

NEWS

Sugarbeet Root Disposal in Farm Fields

In the past week, a number of questions have been asked about land application of unprocessed sugarbeet roots. Currently, few regulations exist as to application rates. In the fall of 1992, Dr. Larry Smith, U of MN Northwest Experiment Station, and Dr. John Moraghan, North Dakota State University, started a study to determine soil nutrient status and crop production effects of land application of 100 tons per acre. These beet roots were fall-applied and roto-tilled into the soil. During the following growing season, the ground was fallowed to allow the study of the nutrient changes.

Overall results revealed no toxic effects to the soil from this practice. Information collected shows that 100 tons per acre root applications have 20.6% dry matter, 327 lb total nitrogen per acre of which 15 lb per acre is nitrate-N. The beet roots also had 29 lb chloride, 22 lb sodium, and 248 lb of potassium. Twelve months after application the soil total N was increased 0.01 to 0.023%, Olsen P changed 1.6 to 3.0 ppm, and soil test K increased 92 to 101 ppm. The increases in N and K were significant while soil test P was not influenced.

The major problem occurring was immobilization (tie-up) of nitrogen by microorganisms because of the excess carbon from the sugarbeet roots. This tie-up of N continues until late July when the carbon-nitrogen composition allows for N to be remobilized. With this remobilization occurring, there is a need to have a plant cover crop to utilize the nitrogen released to minimize the potential

amount of N lost to the environment from leaching or denitrification.

Production practices recommended for spring applied sugarbeet roots include:

1. Use a heavy disk to incorporate the beet root and to obtain the best seedbed possible.
2. Although the seedbed will not be perfect, it should allow for reasonable plant establishment.

Continued on page

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- Sugarbeet Root Disposal in Farm Fields*
- Soil Testing for Lawns and Gardens*
- Skip-Row Application of Anhydrous Ammonia*
- A Statewide Soil N Test Option for Corn*
- Calculating Manure Application Rates to Calibrate Equipment*
- Field Selection/Variety Selection: Keys to Managing Wheat Diseases in 1995*
- Dial U*
- Raspberry Anthracnose*
- Good News (Home Fruit Spray Guide)*
- Indoor Planting Time*
- Internet Crop Systems Resources: Minnesota Extension Service Gopher*

Sugarbeet Root Disposal/Continued

3. Some N will need to be applied for early season plant growth.
4. If not planting a field crop, a cover crop should be established early with an initial N application to reduce erosion, reduce occurrence of fallow syndrome, and capture the N remobilized in the last part of the growing season (August and September).
5. Research with spring wheat in the year following the application indicates no grain yield reduction occurred from the application of sugarbeet roots.

More information can be found in the following reports:

Mraghan, J.T., and L.J. Smith. 1994. *Decomposition of sugarbeet roots in soil*. 1993 Sugarbeet Research and Extension Reports 24:278-283.

Moraghan, J.T., and L.J. Smith. 1995. *Deposital of surplus sugarbeet roots - Soil nitrogen studies*. 1994 Sugarbeet Research and Extension Reports 25:215-222.

Moraghan, J.T., and L.J. Smith. 1995. *Disposal of surplus sugarbeet roots - Wheat studies*. 1994 Sugarbeet Research and Extension Reports 25:223-226.

John Lamb
Department of Soil, Water, and Climate

Soil Testing for Lawns and Gardens

Soil testing is as important for home owners as it is for farmers. The use of this management tool provides a good basis for effective, but not excessive, application of essential nutrients for lawns and gardens.

This spring would be an excellent time for collection of soil samples by homeowners. The garden and lawn should be sampled separately. Fertilizer applications for each can be matched to the results of the soil test.

To collect the sample, soil should be taken from a depth of 0 to 8 inches at several locations in the lawn or garden. The soil that is collected should be mixed thoroughly, packaged, and sent to the Soil Testing Laboratory. The fertilizer recommendations will arrive three or four days after the samples reach the laboratory. Sample bags are available at the local County Extension Office.

George Rehm
Department of Soil, Water, and Climate

Skip-Row Application of Anhydrous Ammonia

The sidedress application of anhydrous ammonia for corn is still a popular practice. Loss of anhydrous ammonia applied at this time could be reduced if the applicator knives were 60 inches apart. This spacing would also reduce the power requirement. Several have asked if this practice reduces corn yields.

Results of a study conducted at the West-Central Experiment Station in 1994 show that yields were not affected by knife spacing when several rates of nitrogen were applied. (See Table).

There are some precautions and special considerations for farmers who want to use the 60-inch spacing. This practice requires that special attention be given to loss due to volatilization. If you smell anhydrous ammonia, loss could be substantial. If a loss is detected, set the applicator deeper

Effect of anhydrous ammonia applicator knife spacing on corn grain yield.

Nitrogen Applied lb./acre	Knife Spacing (in.)	
	30	60
	--- bu./acre ---	
0	81	81
32	107	114
72	150	149
108	143	153
144	159	160

Source: Dr. Sam Evans, West-Central Experiment Station

in the soil or wait until soil moisture conditions are more acceptable for application. This wide spacing is suggested for sidedress applications only at this time.

George Rehm
Department of Soil, Water, and Climate

A Statewide Soil N Test Option for Corn

Recent research has indicated that measuring residual, available N through a soil test can refine current N recommendations for corn throughout Minnesota. This soil N test involves collecting 0-2 ft. soil samples in the spring before planting and having the samples analyzed for nitrate-N. The quantity of nitrate-N found is then used to calculate a residual N credit.

Where/When to use this Test

The new soil N testing option, which accounts for residual N, will not be appropriate for all fields and conditions. There are certain conditions where the new 0-2 ft. preplant soil nitrate-N test has the greatest utility and impact. The user should first evaluate whether conditions exist for residual N to accumulate.

A crop rotation that has corn following corn generally provides the greatest potential for significant residual N accumulation. The amount of residual N in the soil is also dependent on the rainfall received the previous summer and fall. The less rainfall, the higher probability of significant residual N. Field with a manure "history" will more likely have residual N.

How to Use the Test

University of Minnesota's long-standing N recommendations are still the starting point for all recommendations. A five-step process is suggested for making corn N recommendations when the soil N test is considered.

1. Determine N recommendation using yield goal, previous crop, and organic matter content for the specific field.

2. Determine whether conditions are such that residual N may be appreciable based on previous crop, manure history, and previous fall rainfall.

3. If conditions suggest that a soil N test is warranted, collect a preplant, 0-2 ft. soil sample. The sample should be sent to a laboratory and analyzed for nitrate-N.

4. Determine residual N credit based on the measured soil nitrate-N concentrations. Use Table 1 to determine this credit.

Table 1. Soil N credit amounts based on 0-2 ft. spring preplant nitrate-N test.

Nitrate-N - ppm -	N credit - lbs/A -
<6.0	0
6.1 - 9.0	35
9.1 - 12.0	65
12.1 - 15.0	95
15.1 - 18.0	125
>18.1	155

5. Calculate the final N recommendation by subtracting the residual N credit (Step 4) from the initial N recommendations (Step 1).

This soil N test should *not* be used when commercial fertilizer was applied in the previous fall. This test is also not recommended when alfalfa was the previous crop.

Further details regarding the use and interpretation of this test should be read in the Extension Bulletin FO-6514, *A Soil Nitrogen Test Option for N Recommendations With Corn* — available at all county Extension Service Offices.

Mike Schmitt, Extension Soil Scientist.
Gyles Randall, Soil Scientist/So. Exp Sta., Waseca

Calculating Manure Application Rates to Calibrate Equipment

Many farmers and crop advisors have rediscovered the value and benefit of maximizing the use of livestock manure in crop production. By improving their livestock waste application practices, farmers have lowered input costs while maintaining yields and soil productivity. A major factor con-

tributing to this improvement is the effort by farmers to apply manure uniformly and to better understand the rate of application from their equipment.

In order to properly manage nutrients in manure,

Manure Application Rates/Continued

determine a manure application rate requires knowing: 1) the area spread (sq ft or acres) and 2) the amount spread (tons or gallons). The easiest and probably the least accurate method of calculating a manure rate is to estimate the amount in the spreader (example: 250 bu. box spreader holds about 4- 5 tons semi-solid manure) and count the number of loads applied to a known acreage. Divide the total tons of manure applied by the number of acres to attain tons/acre. Liquid manure application rates can be calculated in a similar way by using 90% of tank capacity as the realistic amount being delivered to a field and count the number of loads applied. Again, divide the total gallons applied by the number of acres to attain gals/acre.

A more accurate method of calibrating waste application equipment is to weigh the spreader before and after application to obtain a net weight and to measure the area that had manure applied. For example, a box spreader with an application width of 10 feet travels 1250 feet to cover an area of $10 \times 1250 = 12,500$ sq ft or 0.29 acre (12,500 sq ft divided by 43560 sq ft/A = 0.29 acre). If

10,500 lbs or 5.25 tons of manure were applied on 0.29 acre, the rate per acre is 18.1 tons (5.25 tons divided by 0.29 acre = 18.1 tons/A). Liquid manure application rates can be determined by the same method assuming manure weighs 8.3 lbs/gal. If 34,000 lbs of liquid manure or about 4100 gals (34,000 lbs divided by 8.3 lbs/gal = 4096 gals) were applied on 0.29 acre, the rate per acre is:

14,124 gals (4096 gals divided by 0.29 acre).

Farmers that have determined manure application rates by this procedure are often surprised at the large amount applied. This is particularly the case where older equipment is used and rates can't be easily adjusted. In addition, when the rate applied and nutrient levels in the manure are both considered, farmers have been pleased to discover the amount of plant food the livestock are contributing to their overall soil fertility program. Determining accurate manure application rates and uniformly applying manure are important economical and environmental factors for livestock producers to consider in raising crops.

*Tim Wagar
Extension Educator*

Field Selection / Variety Selection: Keys to Managing Wheat Diseases in 1995

Anguish over limited control options for managing Fusarium scab and other diseases in 1995 has many growers not knowing which way to turn. Dirty residue, limited resistance options and even more limited financial options have created quite a predicament. After variety selection decisions are complete, 1995 planting seed should be considered as requiring a fungicide treatment unless exceptional conditions are met (i.e. seed is has a very high germ (> 95%) or it has good germ (> 90%) and is to be planted early (into cool soils) or seed was purchased outside areas that have been affected by Fusarium scab during the last four years). Several effective seed treatment materials are available including those containing maneb and those containing thiabendazole. Trials conducted in 1994 on scabby seed (at Crookston, Morris, and Roseau) showed a significant benefit from treating

seed with DB Green or Vitavax Extra. Dividend, the new triazole seed treatment from Ciba also improved final stand when applied to a highly infected lot of Norm wheat in these tests.

As always, seed should be cleaned prior to applying fungicides. But cleaning does not remove a majority of the Fusarium. Badly damaged seed is usually shriveled. Many of these seed will not germinate or will produce very weak seedlings. Cleaning these out before treating the seed will make even applications to remaining seed easier to achieve. Even plump seed, however, contains lot of surface-borne and shallow Fusarium infections. To reduce the seedling blight these can cause, treat seed with an effective fungicide and plant into a well prepared seed bed.

Resistance deployment:

Another factor to consider in managing diseases for 1995 involves field selection. To minimize loss due to *Fusarium* head blight and leafspot diseases, plant less susceptible varieties on appropriate fields. Varieties like Grandin, with high susceptibility to *Septoria* and other leafspot diseases should be planted on fields that have been rotated to a non-host the previous year. Non-host fields include those planted to beans, beets, potatoes, or sunflowers in 1994. Varieties with partial resistance to scab, like 2375, should be planted where their resistance is most needed (after crops of *Fusarium*-damaged barley or wheat). Small grains should not be planted after corn unless growers are very confident that *Fusarium* ear rot was not present in the crop or in the crowns and stalks of surviving residue.

In general, selection of fields for varieties other than 2375 and Grandin depend on their sensitivity to scab on the one hand and leafspots on the other. Marshall and Nordic are partially resistant to scab and both are tolerant to *Septoria*. These varieties would be the best choices in fields where wheat will not be rotated (i.e. wheat on wheat) and *Septoria* diseases were prevalent in 94 (i.e. fields of heavily damaged Grandin). Sharp and Butte 86 are additional varieties that have been identified as moderately susceptible/moderately resistant to scab. These varieties are susceptible to *Septoria* (but not as susceptible as Grandin). They could lodge under high fertility but they are less prone to shattering than 2375.

Planting any variety that is highly susceptible (HS) to scab should be considered too risky for 1995. Contaminated residue and contaminated seed supplies remain at very high levels and the outlook for weather favorable for disease development is just too great to risk significant acreages of Gus, Korona, Minnpro, Norm, Sonja or Vance if scab was a problem on your farm in 1994.

Spring tillage:

The residue of our 1994 crop is heavily contaminated with inoculum of *Septoria nodorum*, especially fields in the Northwest that were planted to Grandin last year. Reducing primary inoculum in these fields using tillage implements that bury this residue will delay the development of *Septoria* diseases. Tan spot inoculum will also be reduced.

The impact of tillage on the development of scab is more controversial. But it is clear that infected seed and chaff are major sources of primary inoculum and reduction of these sources with additional tillage won't hurt in our efforts to battle scab this year. We would do well to consider the residue of wheat (and barley) as major sources of our disease problems in these crops. Other than fungicides (which are expensive) and in-season rainfall (which we cannot control), tillage is our primary tool in reducing residue-borne diseases.

Planting date:

There has been a lot of discussion about the relationship between planting date and scab. The influence of planting date on scab has been documented in research trials conducted over the last two seasons. Very little can be said about this relationship other than that it exists. Scab severity is often different within different planting dates of the same variety. Inoculum availability, on the other hand, is most difficult to predict. The interaction of inoculum, rainfall, and flowering is ever more difficult (impossible?) to project while sitting in your kitchen some morning in March trying to decide when to start planting.

There are some things we do know. Delayed planting typically enhances risk from several yield reducing factors including insects, virus diseases and high temperatures. The warmer soil temperatures that might result from delayed planting will certainly enhance seedling blight caused by *Fusarium*. The observation that early planted fields were the most heavily damaged by head blight in 1994 was, however, quite accurate (especially April plantings from Ada/Mahnomen north). That these exact conditions will redevelop in 1995 is difficult to say and "staggered" planting dates seems to me about the best way to ensure some window for scab some place at some time. I would suggest that planting dates, while they can be manipulated, don't offer much "escape" that is predictable. Field preparation, planting conditions and labor considerations should drive the planting date decision. If you want to plant late, remember that seed treatments will be even more critical.

Roger K. Jones
Extension Plant Pathologist

Dial U

County Agents: Please Alert Master Gardeners to the Following Items

Raspberry Anthracnose has been a serious problem on raspberries the last few wet years. Soon it will be time to make the critical fungicide application which, along with good management, will keep anthracnose to a *bare* minimum. Apply liquid lime-sulfur according to label directions when the new leaves are 1/4 to 3/4 inches in length. Later applications can cause burn. Water only at the base of the plants and water infrequently.

Good News. The revised *Home Fruit Spray Guide*, MI-0675, is due back from the printer this week and should be available from the Distribution Center on the St. Paul campus and county offices in the very near future.

Cynthia Ash
Assistant Extension Plant Pathologist

Indoor Planting Time. Now's the time to start planting garden seeds that require 6 to 8 weeks growth indoors before transferring them to the garden. This definitely includes tomato seeds! If you start them too early, they're more likely to be tall and floppy, especially if you aren't growing

them a few inches below fluorescent lights. Even if they're robust plants, they may have their growth checked by staying indoors in small containers too long.

Ideally, you want to plant small, vigorously growing seedlings that will take off the minute they're in the garden. Wait till soil temperatures have warmed before planting tomatoes out, though, towards the end of May or early June. It's not good enough just to escape frost. Cold soil will slow them down, reducing their total output at harvest time.

If you're set on putting tomatoes, peppers or other "warm-season" vegetables out early, you can warm the soil by spreading sheets of dark plastic mulch a couple weeks ahead of time. (*Clear plastic works better, but it acts like a greenhouse for any weed seeds sitting in the soil beneath it. Dark plastic usually retards weed growth by denying the light that's needed for germination*)

Deborah Brown
Extension Horticulturist

Internet Crop Systems Resources: Minnesota Extension Service Gopher

The EXTEND Team of the Minnesota Extension Service maintains a gopher server
(gopher.mes.umn.edu)

for public access from remote sites. In this issue of *MN Crop News* we will identify a few gopher sites that contain abstracts, fact sheets, documents, publications and other crop related information.

Cornell provides field crop and agronomy information at:

Name=Field Crops and Agronomy - Cornell
Type=1
Port=80
Path=1/cenet/submenu/field-crops
Host=www.cce.cornell.edu

Cornell's Mann Library offers crop and other data at:

Name=Crop Data - Cornell Mann Library
Type=1
Port=70
Path=
Host=oldal.mannlib.cornell.edu

Michigan's stores integrated pest management information at:

Name=Integrated Pest Management - Michiga
Type=1
Port=70
Path=1/outreach/ipm
Host=burrow.cl.msu.edu

Minnesota Statutes (1994) for agriculture are at:

Name=Minnesota Statutes 1994, Agriculture
17-43

Type=1

Port=70

Path=1/.revisor/stat1994/17_43

Host=mnrosdp.revisor.leg.state.mn.us

North Carolina's keeps plant pathology notes at:

Name=Plant Pathology (Information Notes) -
NCSU

Type=1

Port=70

Path=1/subjects/.plantpath

Host=gopher.ces.ncsu.edu

Pennsylvania's PenPages database search is at:

Name=Pennsylvania - PenPages

Type=1

Port=70

Path=

Host=psupena.psu.ed

Purdue has crop publications at:

Name=Crop Publications - Purdue

Type=1+

Port=70

Path=1/Extension/Agriculture

Host=hermes.ecn.purdue.edu

Texas A & M stores abstracts of agronomy, chemical use, entomology, plant pathology safety publications at:

Name=Crop Information - Texas

Type=1

Port=70

Path=1s/pubs

Host=leviathan.tamu.edu

Texas A & M furnishes abstracts of other agronomy publications at:

Name=Agronomy Publications - Texas

Type=1

Port=70

Path=1/.dir/agcom.dir/pubs/AGRONOMY

Host=tam2000.tamu.edu

Univ. of Delaware offers fact sheets and research abstracts at:

Name=Fact Sheets & Research Abstracts -
Delaware

Type=1

Port=70

Path=1/.pubs

Host=bluehen.ags.udel.edu

Univ. of Missouri supplies abstracts of agricultural engineering, crop, soils, insects and disease publications at:

Name=Crop Publications - Missouri

Type=1

Port=70

Path=1/publications/xplor

Host=etcs.ext.missouri.edu

Univ. of Nebraska offers full text crop related sheets and publication abstracts from the industrial agricultural products center at:

Name=Crop Publications - UNL

Type=1

Port=70

Path=1/ianr

Host=unlvm.unl.edu

Utah makes selected documents available at:

Name=Selected Documents (Utah State
Extension)

Type=1+

Port=70

Path=1/docs

Host=extsparc.agsci.usu.edu.

Virginia Tech furnishes full text entomology, plant soil and water quality documents at:

Name=Crop Documents - Virginia Tech

Type=1+

Port=70

Path=1/vce-data

Host=gopher.ext.vt.edu

The USDA, Animal and Plant Health Inspection's APHIS Gopher provides full text plant pest and disease information at;

Name=Plant Pest and Disease Information

Type=1

Port=70

Path=1/AI/PPDI

Host=vsnetman.aphis.ag.gov

For assistance on reaching these gopher addresses or to receive an electronic copy of these addresses send e-mail to:

fhoefer@mes.umn.edu

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CROP

NEWS

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vol.1:
no.2

DOCUMENTS
From the
Crops System Team
of the
Minnesota Extension Service
MARCH 1 1995
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SOYBEAN SEED TREATMENT/1995

What should I do in 1995? Soybean seed treatment is a choice, not the standard or norm like it is with corn. Why should I treat soybean seed? It costs and the seed cannot be returned. Growers who have tried it report mixed results and in some years and seasons it does not result in increased yield. Soybean seed quality is so good, growers often don't believe seed performance can be modified by seed treatments.

In Minnesota we have identified three situations that need seed treatment. First, if the seed lot is infested with a fungus, like *Phomopsis*, the improvement in germination is nearly one for one for each seed infested. If the seed lot has 20% seed infection and the seed is still alive, not killed by the fungus, application of a suitable fungicide will improve germination and establishment by about 20%. Second, if the seed does not have adequate *Phytophthora* resistance or "field tolerance" the addition of an appropriate seed treatment will protect the developing seedling in the early stages when seed and seedling rot can occur. The third situation is early planting into less prepared soils (low till) sites with high residue. This environment is more prone to have seedling disease pressure and is the last situation where seed treatments are now recommended.

In 1994, my one test site at Rosemount had no response to seed treatments when planting directly in to standing corn residue. The seedling stand was adequate in all plots and yields were nearly identical. Should I conclude seed treatment is a poor recommendation? I don't believe so, as the period following planting was ideal for seedling

germination and establishment. In studies over a wide area (several states), it is reported that 20% of the stands were improved and 25% of the test sites showed a yield increase of 3 or more bushel/acre.

Seed treatment is a risk prevention decision. The risk may not always appear, but in '94 test sites a stand and yield benefit is received 20 to 25 % of the time. What is your risk potential? Should you consider treating some of your soybean acreage? I'd recommend you review the results of early soybean stand establishment on your farm, by soil type and expected planting date before you decide to not consider trying soybean seed treatments in 1995. A combination of 2 or 3 seed treatment fungicides appears to be the best choice. Results in '94 also show that soybean seedling establishment from deep planting is more difficult. How accurate is your seed placement (depth) with the drill and speed of your operation over low till sites? This could be part of the problem reported by several no-till drill farmers in 1994.

Ward C. Stienstra
Extension Plant Pathologist

Highlights...March 10, 1995

Soybean Seed Treatment/1995

Alfalfa Establishment on Sandy Soils

Price of N Fertilizer and Corn Grain Yields

More Internet Crop Systems Resources

ALFALFA ESTABLISHMENT ON SANDY SOILS

Establishing a satisfactory stand is a major concern for producers growing alfalfa on sandy soils. Unless irrigated, the surface of the sandy soil dries rapidly and there is a subsequent reduction in germination.

Beginning in 1991, trials were conducted at an irrigated site at Staples to evaluate various methods of seeding alfalfa on a sandy soil. Irrigation was used to eliminate variability at the site. Five methods (identified as A through E) were used and are described as follows:

- A:** clean seedbed, herbicide applied preplant and incorporated for weed control
- B:** oats used as a nurse crop and harvested as oatlage; oats planted first; alfalfa planted soon after emergence of the oats
- C:** oats and alfalfa planted as in method B; oats killed by using Poast when 14 inches tall

D: oats seeded in mid-July; alfalfa seeded into emerged oats in early August

E: oats planted in April and harvested for grain; alfalfa seeded into oats stubble without tillage.

Alfalfa was seeded in 1991. The seeding methods were repeated in 1992. Yields from the 1991 seeding were harvested in 1992 and 1993. Yields from the 1992 seeding were harvested in 1993 and 1994. These 2-year yields are summarized in the following table. These yields are averages for both seeding trials.

All methods produced acceptable stands. Total production was slightly lower when alfalfa was seeded in August (methods D and E). There is no apparent explanation for this reduction. These results show that the alfalfa producer can choose from a variety of establishment options when seeding alfalfa on sandy soils.

*George Rehm
Extension Soil Scientist*

Effect of establishment method on alfalfa yields for two years following the establishment year.

<u>Method Designation</u>				
A	B	C	D	E
----- tons dry matter/acre -----				
9.1	8.8	8.7	7.7	8.1

PRICE OF N FERTILIZER AND CORN GRAIN YIELDS

Nitrogen fertilizer prices will be significantly higher in 1995 than any of the preceding years. This price increase is a result of global fertilizer markets, nonagricultural demands, and temporary reduced supplies. Although these price increases have not hit all N fertilizer products at the same time, eventually the relative price ratios between anhydrous ammonia, urea, and UAN-28 will stabilize.

As a result of these drastic price increases, many producers are considering a straight percentage reduction in fertilizer N rates. For those people growing corn, this strategy could be a costly

mistake based on scores of research studies conducted by University researchers every year. In determining economic N recommendations, the ratio of the cost of N per pound to the price of a bushel of corn sets the optimum N rate in our fertilizer recommendations. Although N prices may have increased by 20-40%, this increased N cost is relatively small (2-5%) when compared to the price of a bushel of corn. Dozens of recent research trials would show that no *economically* optimum rate recommendation changes would be suggested due to the recent price increases.

To minimize fertilizer expenditures, follow some basic fertilizer N management strategies. First, do not add more fertilizer than your recommendations prescribe. This means taking full credit for manure and legume credits. The University of Minnesota N recommendations do not build in any "insurance" N in their formula and do consider all N credits. An additional tool for rate refinement is the new preplant soil N test now available throughout the state. Second, use yield goals based on the previous five-year average—less the lowest yielding year. The yields achieved in 1994 proved in many cases that when the weather is favorable for higher-than-predicted yields, conditions are also

favorable for increased soil N release. Finally, use fertilizer N management strategies that are "best" for your area. Producers often add insurance N when they know that they are not following best management practices.

The 1995 corn crop will suffer if fertilizer N rates are reduced to below recommended rates. There are many fine-tuning strategies that can be implemented to ensure that fertilizer N purchases are kept to a minimum. The grain yield return to fertilizer N is great; let's not jeopardize this return on investment by indiscriminately cutting fertilizer rates without agronomic justification.

*Mike Schmitt
Soil Scientist*

MORE Internet Crop Systems Resources: Minnesota Extension Service Gopher

The EXTEND Team of the Minnesota Extension Service maintains a gopher server containing information accessible to the public. In this issue of the newsletter we will identify the location of additional crop related information available on the MES gopher. If you are not familiar with the MES gopher, point your gopher client software to: gopher.mes.umn.edu

Beginning at the main menu of the MES gopher, MES news releases are available under:

News, Weather and Market Reports

MES News Releases are archived back to 1984.

News, Weather and Market Reports

MES News Release Archive - 1984-present

(type in your key word and click on "Search")

Minnesota Weather forecasts can be found under;

News, Weather and Market Reports

MN Weather (Climatology Reports)

National Weather Service Products

(Uofi Wx Machine)

Back issues of some MES newsletters are under;

News, Weather and Market Reports

Newsletter Archive

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Crops Related Courses and Special Programs can be searched under

Courses and Special Programs

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To search for crop systems information at other gopher sites select;

(NOTE: This is not a full text search. Veronica searches for key word(s) in gopher menu titles.)

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Crop Systems

For questions related to information on this gopher send e-mail to Fred Hoefer (fhoefer@mes.umn.edu), call 612-625-4757 or FAX 612-625-2207.

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Minnesota Crop News

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CROP**NEWS**

*From the
Crops System Team
of the
Minnesota Extension Service*

MAR 11 1995

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Welcome!

This is the first issue of *Minnesota Crop News*, a cooperative effort of faculty of the College of Agriculture who work with plants and crops. This newsletter is designed to get information that relates to crop production, plant diseases, insects and weeds to growers, homeowners, and the agribusiness community.

You can also expect to see results of research projects as well as up-to-date information that has a direct effect on decisions needed to make crop production profitable. Clinic reports which detail topics of current concern to agribusiness and homeowner communities will also be included in this newsletter.

We hope that you find this newsletter to be useful and informative. We welcome your suggestions and comments.

*George Rehm
Extension Soil Scientist*

How High is High?

Soil testing has been and continues to be a major management tool when making decisions about fertilizer use. Most growers who use this management practice recognize the importance for arriving at a fertilizer recommendation when fertilizer is needed. This test can also be used to determine when applications of phosphate and/or potash fertilizer are no longer needed.

Using corn as an example, broadcast applications of phosphate are not recommended when the soil test for phosphorus exceeds 15 ppm (Olsen procedure) or 20 ppm (Bray procedure). Likewise, broadcast applications of potash are not suggested when the soil test for potassium is higher than 160 ppm.

The use of phosphate in a band may increase corn yields when soil test values for P are in the range of 16-20 ppm (Olsen procedure) or 21-25 ppm (Bray procedure). Response of corn to phosphate fertilizer should not be expected when the soil test for P exceeds 20 ppm (Olsen procedure) or 25 ppm (Bray procedure).

For conventional tillage systems, some potash applied in a starter for corn may be beneficial if the soil test for K is in the range of 160-175 ppm. No potash,

either broadcast or banded, will be needed if the soil test for K is higher than 175 ppm. These suggestions for potash use change in ridge-till and no-till planting systems.

*George Rehm
Soil Scientist*

Highlights...February 24, 1995

How High is High?

Should I Inoculate Soybeans this Year?

Pursuit Labeled for Alfalfa in 1995

Managing Stored Grain in Spring

Time to Think Trees

*Are Insect Problems Looming on the 1995
Crop Horizon?*

*Insecticide Suggestions to Control Insect
Pests of Field Crops in 1995 Bulletin*

Internet Crop Systems Resources

Should I Inoculate Soybeans This Year?

Throughout the winter, we've had several questions that relate to inoculation of soybeans. In general, the development of nodules on the root systems of soybeans has not been a problem in southern Minnesota. For growers who use a corn-soybean rotation, the bacteria that are responsible for nodule development and subsequent nitrogen fixation survive in the soil from year to year. Seed inoculation is not suggested unless four or more years have passed since the last soybean crop.

The situation is different for soybean production in the Red River Valley and much of northern Minnesota. For that region, good inoculation and nodule development has been more of a problem. Seed inoculation is suggested for these situations.

This is especially true for fields where nodulation has been limited in the past or fields that will be planted to soybeans for the first time in 1995.

It's important to remember that nodule development can be restricted in soils that are acid. Liming acid soils provides a more suitable environment for nodule growth and development.

Nodules will not be effective if substantial nitrogen, either in the organic or inorganic form, is added to the soil system. Nodules will probably disappear from the root system if the applied nitrogen exceeds 30-40 pounds per acre.

*George Rehm
Soil Scientist*

Pursuit Labeled for Alfalfa in '95

Well it's finally here. Pursuit received a federal label for use on seeding or established alfalfa in 1995. Pursuit is labeled for postemergence use only. Soil-applied Pursuit has the potential to cause alfalfa injury expressed as moderate to severe stunting. Postemergence applications have virtually no long-term injury implications for seedling alfalfa. Apply Pursuit postemergence when seedling alfalfa is greater than the second trifoliate stage and the majority of the weeds are 1-3 inches in height. Pursuit can also be applied to established alfalfa in the fall or spring to dormant alfalfa, or can be applied between cuttings with alfalfa regrowth below 3 inches in height. Our experience shows that good weed coverage is more critical for postmerge applications to established alfalfa, and weeds topped by harvest operations may have relatively low herbicide uptake and possibly reduced performance when applied between cuttings. Whether Pursuit is applied to seedling alfalfa or established alfalfa, there is a four month restriction before replanting alfalfa back into the stand, and either case has a 30-day grazing or harvest restriction. The established alfalfa labeling also requires that no Pursuit applications are applied to the last year of the alfalfa stand prior to rotation to other crops.

Additives for use when applying Pursuit to alfalfa are similar to those on the soybean label.

Use a nonionic surfactant with greater than or equal to 80% active ingredient at the rate of 1 quart per 100 gallons of spray solution. Organosilicone surfactants can be used instead of nonionic surfactants. Crop oil concentrate can be used at the rate of 1 quart per acre when water or temperature stress is present or SUN-IT II can be used at 0.75 to 1 quart per acre. Always add UAN nitrogen fertilizer (1 to 2 quarts per acre) or ammonium sulfate (2.5 pounds per acre). The use rate of Pursuit is 3 to 6 oz. per acre and varies by weed species. Pursuit can be tank mixed with 2,4-DB, Buctril and Poast Plus. See the Pursuit label for specific recommendations. Pursuit on alfalfa is not cleared for aerial applications, must be applied in greater or equal to 10 gallon per acre carrier solution, and is recommended for application with flat fan spray tips only.

The best fit for Pursuit use on alfalfa in Minnesota is for the seedling year. Many of the annual weeds common in seedling alfalfa are controlled with early postemergence applications of Pursuit. The one weakness most noticed in seedling alfalfa would be common lambsquarter suppression. University of Minnesota trials have typically shown that lambsquarter that are suppressed but do not die rarely become major competitors with alfalfa following the first cutting. Injury concerns have been relatively minor in Minnesota for seedling

year applications, and are reflected as general stunting of the alfalfa during the early growth phase. This temporary stunting, when it does occur, has not been as damaging to forage quality or yield as letting aggressive weed competition occur. The 4 oz. rate of application is adequate for most situations for annual weed control in Minnesota. Relatively little work has been done by the University for applications to established alfalfa.

Some preliminary work has shown, however, that postemergence applications to established perennial weeds such as common dandelions, or quackgrass offer little more than suppression. Pursuit offers another in the relatively limited array of products available for alfalfa weed control in Minnesota.

Roger Becker
Extension Agronomist — Weed Science

Managing Stored Grain in Spring

Spring is a critical time for stored grain management. It's important to check condition of stored grain now and take any necessary actions to correct grain temperature or moisture before the weather gets too warm.

First, check grain at the top center of the bin for evidence of moisture migration. Uneven grain temperatures that develop during winter cause convection currents and diffusion, which in turn move moisture to the top center of the bin. Any grain rewet by moisture migration will mold or become infested by insects when the temperature increases this spring. If you find an area of wet grain, either remove it from the bin, or scatter it across the grain surface and try to dry it using the bin's fan.

All grain in the bin should be down to about 14% moisture for storage into summer and 13% for storage beyond summer. In many cases, natural-air drying is not completed before winter, and needs to be finished in spring. Probe natural-air drying bins to locate the drying front and to determine the moisture of the wet grain. If the drying front is at least half way through the bin and all grain is less than about 22% moisture, chances of success are good. Use the following moistures and dates as a guide to restarting the drying fan.

Moisture greater than 19%: start fan about March 15 and run continuously until top is down to desired moisture.

Moisture of 17 to 19%: start fan about April 1 and run continuously until top is down to desired moisture.

Moisture less than 17%: start fan about April 15. Run fan continuously if target moisture is 13 to 14%; stop fan on exceptionally warm, dry days if target moisture is 14 to 15%.

If the grain is dry enough for spring and summer storage, check grain temperature at several depths and locations to make sure it is uniform. Aeration is needed when there are temperature differences of more than about 15 degrees F in different parts of the bin. If you decide to aerate, make sure you do it before average outdoor temperatures (day time high plus night time low divided by two) get much above 40 degrees F. As long as grain is less than about 40 degrees, molds and insects are relatively inactive.

Because condensation occurs when you aerate this time of the year (grain temperature is below the dewpoint temperature of the air), it is important to operate the aeration fan continuously to move the temperature front and layer of condensation all the way through the bin. For a typical storage bin with a small aeration fan, this will take five to seven days. In bins equipped with drying fans, temperature fronts can be moved through a bin in a day or so.

Even if grain is dry and cool going into spring, it is still important to check bins every week. Mold and insect problems can develop very rapidly in warm weather, but catching these problems early will minimize spoilage losses.

Bill Wilcke
Agricultural Engineering

Time to Think Trees

As the weather warms up and we anticipate warm spring days, take a few minutes to assess the health of trees in your landscape. Late winter is the ideal time to prune most shade trees, removing diseased wood and undesirable growth which limits air movement in the tree. Foliage which dries quickly during the growing season is less susceptible to anthracnose, apple scab, powdery mildew and other foliar diseases. However, if you have oak trees, finish pruning by April 15 or wait until after June 30, to prevent the spread of oak wilt. Some trees, like maple and birch, are “bleeders” and although it doesn’t hurt to prune them now, the sap flow is upsetting to some individuals.

Elongate black galls on chokecherry, plum and Mayday tree are easily seen now and removed.

The trick with this disease is to remove black knots and slightly swollen stems (young galls). A dormant application of lime sulfur after pruning is helpful. If you have wild chokecherries in the neighborhood, they should be completely removed—where practical—as they are an excellent source of disease.

Rake up fallen leaves as soon as the lawn is dry to encourage turf growth and to remove leaves which harbor foliar pathogens such as apple scab. Add them to the compost pile or send them out to be composted.

Cynthia L. Ash
Assistant Extension Plant Pathologist

Are Insect Problems Looming on the 1995 Crop Horizon?

The approach of spring brings thoughts of crop planning and remembrance of the 1994 field season. From an entomologist’s perspective, insect pest problems were pretty minimal in 1994, but what will 1995 bring?

Many pest insects in Minnesota are actually migrants with infestation potentials determined in part by next spring’s weather. Examples of insect migrants that can give Minnesota farmers sleepless nights include black cutworm, armyworm, cereal aphids, potato leafhopper, green cloverworm, aster leafhopper. Predicting problems with these pest insects is impossible since the timing of weather events compared to pest development farther south and crop development in Minnesota determine whether or not we see a pest outbreak. The best we can do is keep you posted on if and when

migration is occurring, alert you to scout and share the resulting information. One exception to this “sit and wait” approach is the advance warning of black cutworm activity provided by pheromone traps.

The European corn borer started its comeback in 1994! Infestations caused some concern in NW Minnesota. While first generation did not cause problems in the rest of Minnesota, second generation infestations reached noticeable levels in WC, SW and SE Minnesota and created some management concerns. The number of overwintering borers definitely increased (especially in WC Minnesota, as indicated in the table on page 5) and it appears the population is again building from a historical perspective (see graph). For 1995 I anticipate corn borer problems will increase.

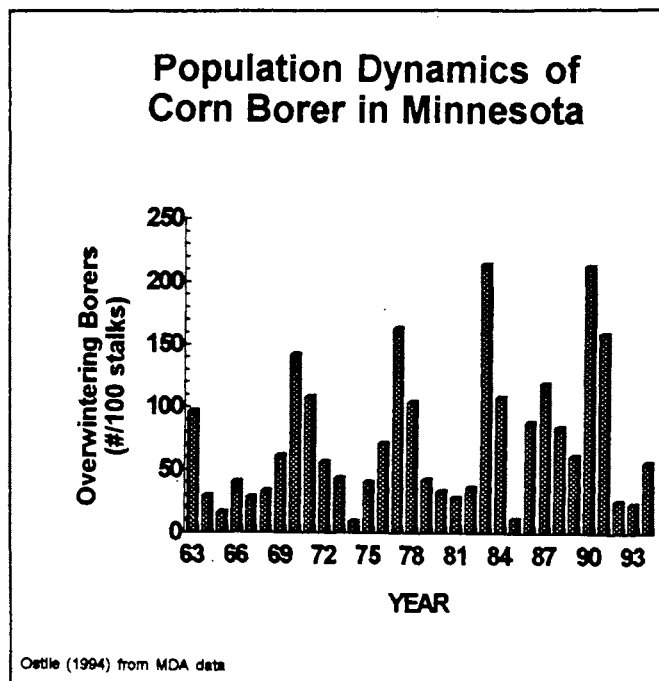
European Corn Borer Abundance and Damage in 1994

District Total	Overwintering Borers (#/plant)	Tunnels/100 plants		% Ear Drop	% Loss
		Gen I	Gen II		
C	34.4	19.6	30.5	0.3	2.20
EC	22.1	22.0	24.9	0.2	2.05
NW	97.8	111.0	0.0	0.1	4.54
SC	23.0	4.8	32.9	0.3	1.53
SE	67.2	18.4	83.2	0.6	4.02
SW	66.1	41.2	32.1	0.1	3.12
WC	124.5	56.6	74.6	0.2	5.27
State Averages	63.3	40.6	38.7	0.3	3.79

Data supplied by Minnesota Department of Agriculture-Plant Protection Division.

Corn rootworm populations in 1994 slowly recovering from the beating they took through two extremely wet summers. Populations in SW and WC Minnesota remain generally low (see table on corn rootworm) and I expect a high proportion of fields will not provide an economical return to soil insecticide use. **Note:** For a given field, populations over 1 beetle per plant indicate enough egg laying to justify soil insecticide use if corn is grown the following year. Corn rootworm populations were slightly higher in SC Minnesota. The only area with abundant corn rootworms appears to be SE Minnesota. Soil insecticide use in 1995 may bring better returns than we saw in a 1989-1993 study, where economic returns occurred in only 9% of the 43 fields studied. "Insurance" use of soil insecticides will still be a losing proposition. Can farmers continue to lose 6-\$10/acre on "insurance" use of soil insecticides? Scouting adult beetles in 1995 is the only way to predicting where soil insecticides should be used in 1996.

Over the past 4 years we have experienced extremely high infestations of potato leafhopper (PLH), and 1994 was no exception. Despite the fact that PLH does not overwinter in the midwest,



Corn Rootworm Adult Abundance in 1994

District	# Beetles per acre	# Beetles per 10 plants	Ratio		% Lodg.
			NCR	WCR	
C	10180.7	4.3	92.7	7.3	0.0
NW	1065.0	0.4	100.0	0.0	0.0
SC	46734.8	14.2	97.1	2.9	3.7
SE	164800.2	57.1	88.9	11.1	1.0
SW	18539.1	7.4	89.8	10.2	0.3
WC	17290.5	6.8	97.3	2.7	0.7

Data supplied by Minnesota Department of Agriculture-Plant Protection Division.

Insect Problems/ Continued

spring migrations into Minnesota have been very consistent, with PLH usually arriving in late-May to early-June. Because it is a migratory pest, we cannot predict exactly when first flights will occur or the extent of the infestations. As in previous years, however, most of the scouting effort in alfalfa should focus on the early regrowth of the 2nd crop (just after 1st cutting), and new spring-seeded stands (especially direct-seeded). PLH thresholds will be discussed as the season progresses.

A diverse array of biological control agents (parasitic wasps and a fungal pathogen) appear to be providing consistent control of alfalfa weevil.

This was evident during 1994 when our spring weather (warm/dry in May-June) was conducive for a weevil outbreak, yet very few infestations materialized. In addition, in most years, cool wet spring weather favors alfalfa growth over weevil growth. As our biological control agents remain in place, I anticipate fewer outbreak years, e.g., no more than 1 in 10 years.

APHIDS

Small grain aphids continued to generate concern in light of new treatment thresholds. Try out the new scouting guidelines in 1995 as a way of getting familiar with scouting and the new treatment guidelines.

*Ken Ostlie and Bill Hutchison
Extension Entomologists*

Internet Crop Systems Resources: Minnesota Extension Service gopher

The EXTEND Team of the Minnesota Extension Service maintains a gopher server containing information accessible to the public. In this issue of the newsletter we will identify the location of some crop related information available on the MES gopher. If you are not familiar with the MES gopher, point your gopher client software to: gopher.mes.umn.edu

MES Publications and General Information

The Minnesota Extension Service is converting (as time and funds become available) Distribution Center publications into text files for the MES gopher. Only a limited number of publications are currently available in full text. In addition to Distribution Center publications, other general crop systems information is available on the MES gopher. General information includes: weather data from the Extension Meteorologist and DNR Climatology Dept.; reports from the Cereal Rust Laboratory, USDA; the Minnesota Department of Agriculture Newsletter; and other related reports.

Beginning at the main menu of the MES gopher, a key word full text search for publications and information across all subject areas is available under;

Subject Area Information
Search All Subject Areas
(type in your key word and click on "Search")

More Internet tips will appear in the next issue. For questions related to information on this gopher, send e-mail to: fhoefer@mes.umn.edu (Fred Hoefer), call 612-625-4757, or FAX 612-625-2207

Search results using the following key words:

crop = 63 items	insect = 91 items
corn = 32 items	pest = 73 items
bean = 16 items	chemical = 112 items
wheat = 16 items	disease = 112 items
oat = 16 items	fertilizer = 74 items
soil = 170 items	weather = 72 items
pathology = 7 items	temperature = 138 items

The full text of some crop systems related publications available in the Distribution Center are listed under;

Subject Area Information
Crop Systems
Publications

To reach general crop systems information (items not in the Distribution Center), use the following path;

Subject Area Information
Crop Systems
General Information

To search for MES Distribution Center titles related to crop systems, take the following paths;

Educational Materials Catalog and Ordering Information
Search All Educational Materials Abstracts
(type in your key word and click on "Search")
or Consumer Catalogs by Subject Area
Agriculture Consumer Catalog
(click on the "Find" button)
(type in your key word and press the <Enter> key)

ANNOUNCING

The new
Minnesota Extension Service
**Insecticide Suggestions to Control
Insect Pests of Field Crops in 1995**
Bulletin



The latest information on insect management using insecticides for over a dozen crops.

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Minnesota Crop News

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CROP**NEWS****LAST ISSUE OF MINNESOTA CROP NEWS**

This is the **LAST** issue of *Minnesota Crop News*. We hope the information we have published has been useful to you. Thanks to all who returned their survey form. We received many good comments and hope to use the information to make the newsletter even better.

If you have not sent in your subscription for the 96-97 season, please do so as the season will begin February 15th.

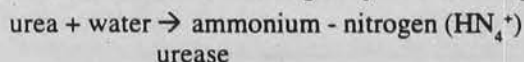
Send your payment of \$25.00 (made payable to the University of Minnesota) to:

Debbie Baden Drange
Department of Plant Pathology
495 Borlaug Hall, 1991 Upper Buford
University of Minnesota
St. Paul, MN 55108
(612) 625-6290

AGROTAIN

AGROTAIN is a new product which has entered the fertilizer market for 1996. Some explanation of how this product works and its place in Minnesota agriculture is probably needed. This product is a urease inhibitor that is being marketed by IMC-Agrico Company. It is designed to be used in situations where loss of nitrogen from surface applied urea or liquid nitrogen (28-0-0) sources is a possibility.

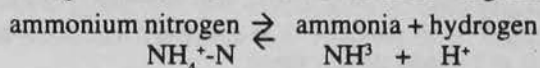
To help in understanding potential uses, some understanding of the transformation of urea in soils would be helpful. When applied to soils — if there is moisture, urea is converted to ammonium nitrogen by the following reaction:



The urease enzyme is present in all soils and this reaction takes place as soon as the urea dissolves in water in soils. Urea is very soluble and will dissolve if left on the soil surface and there is high humidity. AGROTAIN blocks this reaction from taking place for up to 14 days.

The ammonium-nitrogen (NH₄⁺-N) can attach to the

negatively charged soil particles. Some of the ammonium-nitrogen can be lost if we use the following reaction:



The ammonia can be lost to the atmosphere. This loss usually increases as the pH increases. If urea dissolves

Highlights...January 12, 1996

Agrotain
Alfalfa Establishment on Sandy Soils
Plant Disease Clinic
Samples Submitted to the Plant Disease
Clinic in December Included:
Dial U

AGROTAIN/Continued

and moves into the soil before being converted to ammonium-nitrogen, loss is prevented. If urea is incorporated by tillage or rainfall (about .25 inches), loss of nitrogen as ammonia is prevented. By delaying the conversion of urea to ammonium-nitrogen for 14 days, nitrogen loss is prevented if there is no physical incorporation or rainfall in that period of time. If AGROTAIN is used and there is no incorporation as rainfall within 14 days after application, some nitrogen may then be lost.

The potential for the use of AGROTAIN is greatest where urea or 28-0-0 is broadcast on the soil surface in high residue situations (no-till corn production). This tillage system is not used on large acreages in Minnesota. There is also a potential use for situations where nitrogen fertilizer is topdressed to small grains. This is also a limited practice in Minnesota.

AGROTAIN has been researched by several universities and is a very effective urease inhibitor. Potential for widespread use in Minnesota, however, is limited to specific planting systems and nitrogen management practices for small grains.

*George Rehm
Extension Soil Scientist*

ALFALFA ESTABLISHMENT ON SANDY SOILS

Establishment has always been a major concern of forage producers. This is especially true when legumes are grown on sandy soils. There are several methods that can be used for establishment. Recently, five of these methods were evaluated in a study conducted at the Irrigation Center at Staples.

The alfalfa yields in the establishment year and the total for the two years following establishment are listed in the following table. Establishment methods are identified by letter and are described below.

Effect of method of establishment of yield of alfalfa grown on a sandy soil in Minnesota.

Method Identification	Yield	
	1991 - tons of dry matter per acre -	1992 plus 1993
A		10.5
B	3.0	9.8
C	1.7	9.5
D	-	7.6
E	-	8.7

Method C: The seedbed was prepared by conventional tillage operations. The herbicide, Balan, was applied and incorporated. The alfalfa was seeded in early May.

Method B: The seedbed was prepared by conventional tillage. The alfalfa was seeded with oats. Oats was harvested for forage at the soft dough stage.

Method C: The procedure used for Method B was followed. The oats crop was killed with the herbicide, Poast, when it reached a height of 10-14 inches.

Method D: Oats was grown and harvested for grain. The oats was seeded again in mid-July. The alfalfa was seeded into the emerging second crop with a no-till technique in early August. The second oats crop was killed by the first hard frost in the fall.

Method E: Oats was grown and harvested for grain. Alfalfa was seeded into the oats stubble with a no-till technique in early August.

Because of the August seeding in 1991, there were no yield measurements for methods D and E in the establishment year. First-year yield was lower when method C was used.

Considering total production in 1992 and 1993, yields were highest for method A where there was no competition from weeds during the early phases of establishment. Lowest yields resulted from the August seeding (Methods D and E). Yields resulting from the use of methods B and C were intermediate. There is no easy explanation for the lower yields resulting from the no-till establishment methods.

Stand counts were also recorded for each establishment method. The method of establishment had no major impact on stand. All methods produced acceptable stands.

This study showed that there are several methods that can be used for successful establishment of alfalfa grown on sandy soils. These various methods can be adapted to a wide variety of farm enterprises and management situations.

*George Rehm
Extension Soil Scientist*

Plant Disease Clinic

SAMPLES SUBMITTED TO THE PLANT DISEASE CLINIC IN DECEMBER INCLUDED:

corn feed and silage—mold identification
soybean—soil for soybean cyst nematode egg count
sorghum seed—mold identification
sugarbeet—bioassay of soil for *Aphanomyces* sp
carrot—*Sclerotinia* sp root rot
cyclamen—Impatiens necrotic spot virus (INSV)
begonia—INSV
spikes—INSV
cineraria—INSV
geranium—tested for *Xanthomonas campestris* pv *pelargonii* (bacterial wilt),
Pythium sp root and stem rot
chrysanthemum—no disease

Thanks to everyone who used the Plant Disease Clinic services in 1995 and best wishes for a productive year in 1996!

Sandra Gould
Plant Disease Clinic

DIAL U

Dial U is a user-fee telephone diagnostic clinic for calls and samples related to gardening, landscapes, plant diseases, insects and wildlife associated with the home environment. Calls from the public are taken at 1-900-988-0500 weekdays. A flat \$2.99 charge is billed automatically to the phone from which the call is placed.

Houseplant Woes Surface in Winter

Many of the calls to Dial U this time of year relate to houseplants, plants that are suffering the stresses of reduced light, dry air and extremes of temperature, either from cold leaking through windows or heat from radiators and warm air ducts.

Few plants grow rapidly in the middle of winter; those that do are usually in bright, sunny south-facing windows or they may receive supplemental lighting from fluorescent lights. When plants grow slowly you must reduce fertilizing substantially. Brown tips and leaf margins are a common result of regular fertilizing, whether the plant needs it or not.

Tip burn is also more common when you allow plants to get too dry between waterings. In winter our rooms are cooler, but the air is so dry you may need to water as often—or even more often—than you do in summer. The only way to tell for sure is to feel the soil. Don't just water by the calendar.

Insects are attracted to stressed plants. They also find dusty foliage appealing, so try to keep leaves (and stems) clean, **top and underside**, alike. Dust on the leaf surface also filters light before it reaches the tissue where photosynthesis occurs.

Use a soft, damp rag or spray from the kitchen sink or shower to clean foliage. Dusting wands can move insects and eggs from one plant to another.

Deborah Brown
Extension Horticulturist

1995 Entomology Summary

By far, the most common insect calls we received in 1995 were household ants (about 75% of these calls were carpenter ants). Also common were pantry insects (particularly Indianmeal moths), insect and mite galls (about 40% of these calls were maple bladder galls), wasps, sawflies attacking trees and shrubs (yellowheaded spruce sawflies were the most common calls) and flies (especially fruit flies). Rounding out the top 10 list were houseplant insects and mites, aphids on trees and shrubs, spiders, and caterpillars on trees and shrubs.

We had reasonably normal weather most of the season. We did have a cool spring which probably influenced the aphid natural enemies, allowing aphid numbers to temporarily increase. The same cool spring weather slowed down the initial nest building by wasps. At that time, I would have suspected that wasps would have a below average year. However, the several hot stretches of weather we experienced during the summer apparently helped the wasps make up for lost time with the end result being an average year for wasps.

Yellowheaded spruce sawflies and maple bladder galls were quite common for the third consecutive year, although their numbers appear to be decreasing somewhat. I would expect to see fewer yellowheaded spruce sawflies and maple bladder galls in 1996 as natural enemies catch up with them.

Jeffrey Hahn
Assistant Extension Entomologist

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AND ENVIRONMENTAL SCIENCES

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MINNESOTA

Vol. 1
No. 30

CROP

*From the
Crops System Team
of the
Minnesota Extension Service*

NEWS

Special Edition Minnesota Crop News

AG PROFESSIONAL UPDATE

The Ag Professional Update is designed for agricultural dealers, crop consultants, agency personnel, Vo-tech instructors, farm management instructors, and others involved with crop management decisions. This three and one half hour program will update agricultural professionals on the latest research and crop production recommendations from the University of Minnesota Experiment Stations and Extension Service. 3.5 Continuing Education Units (CEU) have been applied for.

Speakers will include state extension specialists, experiment station researchers, and area extension agents. Speakers will provide educational materials. Appropriate reference materials will also be available. Come prepared to ask questions and discuss your concerns.

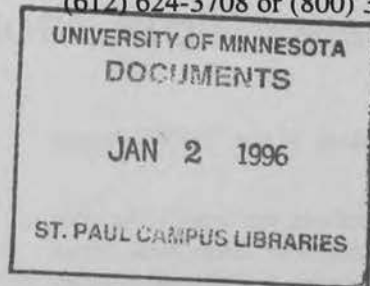
Highlights...December 29, 1995

*Ag Professional Update
Renewal Time Reminder For Minnesota Crop
News
The Value of Corn Stover
Minnesota Crop News Survey*

DATES AND LOCATIONS

- Monday, January 8** — 12:00-4:30 p.m. in St. Cloud at the Holiday Inn.
- Tuesday, January 9** — 12:00-4:30 p.m. in Crookston at the Experiment Station (Ag. Research Center Auditorium).
- Tuesday, January 9** — 12:00-4:30 p.m. in Rochester at the Best Western Apache
- Wednesday, January 10** — 8:00-12:30 p.m. in Morris at the Experiment Station
- Wednesday, January 10** — 8:00-12:30 p.m. in Mankato at the Best Western
- Thursday, January 11** — 8:00-12:30 p.m. in Lamberton at the Experiment Station

For more information on registration, please contact Tracey Benson at the Educational Development System (612) 624-3708 or (800) 367-5363.



*Ward C. Stienstra
Extension Plant Pathologist*

For more information contact Extension Plant Pathology at 612-625-6290

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RENEWAL TIME REMINDER FOR MINNESOTA CROP NEWS

Don't forget to re-subscribe to *Minnesota Crop News*. Our 1996-97 season will begin in February 1996. Please refer to your November 10th *MN Crop News* for the subscription form. If you are unable to locate that issue, mail a check for \$25.00 to the address below. Please make checks payable to the University of Minnesota.

Debbie Baden Drange
Department of Plant Pathology
495 Borlaug Hall
University of Minnesota
St. Paul, MN 55108

Thank you for your interest in our newsletter.

THE VALUE OF CORN STOVER

Corn stover is usually left on the field as residue after harvest and eventually incorporated into the soil. However, in some situations the stover is harvested for bedding or for other uses. When corn stover is harvested, a frequently asked question by growers is: how much is the stover worth? When incorporated into the soil, stover adds both nutrients and organic matter. An estimate of stover nutrient content can be obtained from studies where the stover yield and nutrient content have been determined. A number of these studies have been conducted over the past 6 years. Based on these studies, a summary of stover nutrient content and estimated value on a dry ton basis can be calculated as follows:

<u>Nutrient</u>	<u>lbs per dry ton</u>	<u>\$ per dry ton</u>
N	10.8	1.08
P	1.2 (2.3 P ₂ O ₅)	0.40
K	30.2 (36.4 K ₂ O)	3.93
Other nutrients	--	0.50
Organic matter	--	0.30
Total		6.21

Note that nutrient content is based on a dry weight basis. Corn stover can range from less than 20% to more than 45% moisture depending on the time of harvest. Therefore, determining moisture content is important in order to more accurately estimate nutrient content.

When estimating nutrient value, \$0.20/lb for N, \$0.25/lb for P₂O₅, and \$0.12/lb for K₂O was assumed. It was also assumed that 50% of the N, 70% of the P₂O₅, and 90% of the K₂O would be available. Secondary and micronutrients are collectively worth about \$0.50 per dry ton based on replacement with dolomitic lime, elemental sulfur, granular B, and sulfate forms of Mn, Zn, Cu, and Fe. The value of organic matter was estimated to be worth \$0.30 per dry ton.

An example of estimating the value of harvested stover is as follows: Assume 20 tons of stover was harvested and the moisture content was found to be 30%. Therefore, 20 x 0.7 = 14 ton dry stover was harvested. The value of the stover is \$6.21 per dry ton. Therefore, the value of the stover harvested is: 14 dry tons x \$6.21 = \$86.94.

Carl Rosen
Extension Soil Scientist/Horticulture

MINNESOTA CROP NEWS SURVEY

We want to know what you think of our "NEW" Newsletter:

To better serve our subscribers, we would like your opinions on our "NEW" *Minnesota Crop Newsletter*. Please answer the following questions and mail back to: Debbie Baden Drange, Dept. of Plant Pathology, 495 Borlaug Hall, 1991 Upper Buford Circle, University of

Minnesota, St. Paul, MN 55108 or fax your responses to 612-625-9728. **This survey was adapted from the "Integrated Crop Management", newsletter survey, Iowa State University, by Marlin E. Rice, newsletter coordinator.**

Thank you in advance for your responses.

MINNESOTA CROP NEWS SURVEY

MINNESOTA CROP NEWSLETTER

1) Please rate the quality of the newsletter on the following items. Circle the number that best reflects your opinion.

	Strongly Disagree			Strongly Agree	
The information was timely.....	1	2	3	4	5
The information was useful.....	1	2	3	4	5
The text was easy to read.....	1	2	3	4	5
The information improved my ability to make management decisions	1	2	3	4	5
The value of the newsletter was greater than the cost of the subscription.....	1	2	3	4	5

2) Has *Minnesota Crop News* contained information not available to you elsewhere?

yes
 no

3) Do others read your copy of the newsletter?

yes
 no

4) Have you changed any pest management practice, crop production practice, or recommendation as a result of information in *Minnesota Crop News*?

yes
 no

If yes, check all areas that apply:

crop production
 fertilizer rates
 pesticide selection
 pesticide timing
 scouting practices
 nonchemical controls
 other (please describe)

5) If you make management recommendations from the newsletter, how many farmers receive your recommendations?

6) What do you like best about *Minnesota Crop News*?

7) What do you like the least about *Minnesota Crop News*?

8) What changes, topics, or additional information would you suggest for next year's *Minnesota Crop News*?

9) What is your primary occupation?

farmer
 farm manager
 ag chem/fertilizer dealer
 company sales/tech service
 company agronomist
 commercial pesticide applicator
 crop consultant
 county extension staff
 research/extension specialist
 other (specify)

10) What is your overall opinion of *Minnesota Crop News*?

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COLLEGE OF AGRICULTURAL, FOOD,
AND ENVIRONMENTAL SCIENCES

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University of Minnesota
495 Borlaug Hall
St. Paul, MN 55108-6030**

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Minnesota Crop News Survey..... 200-201

DECEMBER 29, 1995

Minnesota Crop News

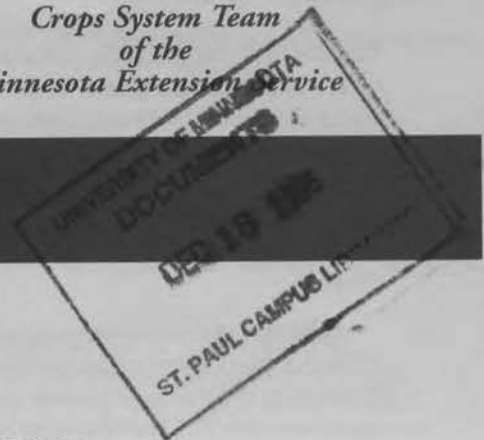
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No. 29

CROP

From the
Crops System Team
of the
Minnesota Extension Service



Midwest Ridge-Till Conference

January 23, 1996 is the date. The Ramkota Inn at Sioux Falls, South Dakota is the place. The Midwest Ridge-Till Conference is planned for those farmers who are currently using the system as well as those who are thinking about switching to the cost-effective conservation tillage production system. This Conference should be of interest to farmers as well as those who advise them.

Commercial exhibits and educational programs are combined in one location under one roof. Successful ridge-till farmers will discuss everything from getting started in ridge-till to new innovations such as twin rows on ridges. The latest in fertilizer and herbicide use information for ridge-till systems will also be presented.

Those who pre-register can save money. The cost for pre-registration is \$20. Registration at the door is \$25. Call Judy Martens at (612) 625-5797 if you need more information about this conference.

The Best Western Ramkota Inn has set rooms aside, at a special rate, for this conference. The telephone number is 1-800-528-1234 for those who want to call and make their own reservations.

The ridge-till system saves soil, fuel, and is very profitable. Those who attend this conference should get more information that will help to make this system even more profitable.

*George Rehm
Extension Soil Scientist*

Highlights...December 15, 1995

- Midwest Ridge-Till Conference
- Using Phosphate Fertilizers For Soybeans
- 1996 Commercial/Non-Commercial Pesticide Applicator Training Workshops
- Crop Production School
- Renewal Time Reminder For Minnesota Crop News
- Plant Disease Clinic
- Gray Leaf Spot
- Soil Moisture Fall 1995
- Verde, New Semidwarf Hard Red Spring Wheat Variety
- New Insect Pest Management Course, January-March, 1996
- Dial U
- Christmas Tree Questions
- Calendar Reminder
- Entomology Calls

USING PHOSPHATE FERTILIZERS FOR SOYBEANS

The soybean crop has frequently been ignored when fertilizer management plans are developed for farmers. The usual plan calls for fertilizing corn and allowing the soybean crop to use the residual or remaining phosphorus and/or potassium. Yet, past research has shown that this crop will respond to the use of phosphate and/or potash if soil test levels for P and K are in the low or very low range.

There continues to be some uncertainty about the most effective placement of immobile nutrients for this crop. Placement is a special concern when soybeans are planted in narrow rows (7 inches) with no-till planting systems.

A study was initiated at the West-Central Experiment Station in the fall of 1994 in an effort to get some answers to these questions. The experimental area was planted to corn in 1994 and phosphate fertilizer was applied following corn harvest. The soybeans were planted in both narrow (7-inch) and wide (30-inch) rows using either a no-till or fall chisel planting system. The phosphate was either banded at a depth of 3-4 inches below the soil surface or broadcast. The broadcast phosphate was incorporated only in the fall chisel system. Yields measured in the fall of 1995 are summarized in the following table.

Soybean yield as affected by tillage system, row spacing, phosphate placement, and rate of phosphate applied.

Tillage System	Row Spacing	Placement	P ₂ O ₅ Applied (lb./acre)					Ave.	
			0	23	46	69	92		
	in.			----- bu./acre -----					
fall chisel	7	-	44.0	-	-	-	-	-	
"	7	band	-	50.8	52.7	52.2	59.8	53.9	
"	7	broadcast	-	<u>51.6</u>	<u>56.4</u>	<u>58.0</u>	<u>59.7</u>	56.4	
		Ave:		51.2	54.6	55.1	59.8		
fall chisel	30	-	29.9	-	-	-	-	-	
"	30	band	-	37.3	35.7	40.0	43.1	39.0	
"	30	broadcast	-	<u>38.1</u>	<u>32.1</u>	<u>42.5</u>	<u>44.5</u>	39.3	
		Ave:		37.7	33.9	41.3	43.8		
no-till	7	-	44.0	-	-	-	-	-	
"	7	band	-	46.0	52.4	53.4	48.2	50.0	
"	7	broadcast	-	<u>46.7</u>	<u>54.2</u>	<u>55.7</u>	<u>55.9</u>	53.1	
		Ave:		46.4	53.3	54.6	52.1		
no-till	30	-	29.9	-	-	-	-	-	
"	30	band	-	32.0	34.4	37.0	39.1	35.6	
"	30	broadcast	-	<u>37.0</u>	<u>37.3</u>	<u>36.7</u>	<u>40.7</u>	37.9	
		Ave:		34.5	35.9	36.9	39.9		

Soil Test P = 3 ppm (Bray), 4 ppm ((Olsen)

The application of phosphate fertilizer increased soybean yields for both tillage systems and each row spacing in the two systems. Yield increases were substantial and the value of the increase is more than the cost of the phosphate fertilizer. Considering the low soil test values for phosphorus, a response to the use of phosphate fertilizer would be expected.

When averaged over other factors, yields were higher when the fall chisel system is compared to the no-till system (47.2 bu./acre vs. 44.2 bu./acre). Yields were also higher when 7-inch rows are compared to 30-inch rows (53.4 bu./acre vs. 38.0 bu./acre). The advantage of narrow rows was consistent for both tillage systems.

When averaged for all rates, both tillage systems and both row spacings, yields were higher when broadcast applications are compared to banded applications (46.7 bu./acre vs. 44.7 bu./acre). The broadcast advantage was consistent for both tillage systems. This result is somewhat surprising for the no-till system where broadcast phosphate would remain on the soil surface.

The results discussed above were results from 1995 only. Corn yields will be used to evaluate the effects of phosphate fertilization in 1996. Useful information should come from this study as the corn/soybean rotation is used over a number of years.

George Rehm
Extension Soil Scientist

1996 COMMERCIAL/NON-COMMERCIAL PESTICIDE APPLICATOR TRAINING WORKSHOPS

The Health, Environmental and Pesticide Safety Program at the Minnesota Extension Service is again sponsoring PAT Recertification Workshops. Pre-registration is strongly recommended. This year we are planning a special session addressing job stress for pesticide applicators.

ALL Minnesota commercial and non-commercial pesticide applicators must apply to the Minnesota Department of Agriculture for license renewal each year in all categories they are licensed. To apply for license renewal applicators must complete a recertification training requirement (either attending a workshop or completing the correspondence course).

Agricultural Recertification Workshop Series

This series of workshops recertifies pesticide applicators licensed in:

Category A: General Ground Applications

Category C: Agricultural Herbicides, and,

Category D: Agricultural Fungicides and Insecticides

Attendance at one of these workshops will allow the applicator to renew their pesticide applicators license for the years 1997, 1998, and 1999.

DATE:	LOCATION:	FACILITY:
January 3	Marshall, MN	Best Western Motel
January 4	Worthington, MN	Holiday Inn
January 5	Fairmont, MN	American Legion Club
January 8	New Ulm, MN	Holiday Inn
January 9	Mankato, MN	Holiday Inn Downtown
January 10	Owatonna, MN	Ramada Inn
January 11	Rochester, MN	Holiday Inn South
January 16,	St. Paul, MN	Earle Brown Center, St. Paul Campus U of MN

Turf & Ornamental Recertification Workshop Series

This series of workshops recertifies pesticide applicators licensed in:

Category A: General Ground Applications

Category E: Turf & Ornamentals (lawn, landscape, nurseries, parks, grounds, etc.)

Attendance at one of these workshops will allow the applicator to renew their pesticide license for the year 1997.

DATE:	LOCATION:	FACILITY:
February 5	St. Paul Campus	Earle Brown Center
February 6	St. Paul Campus	Earle Brown Center
February 8	Mankato, MN	Holiday Inn Downtown
February 13	St. Paul Campus	Earle Brown Center
February 14	St. Paul Campus	Earle Brown Center
February 27	Alexandria, MN	Holiday Inn

For more information, contact Tracy Svee at Extension Special Programs (612) 625-8215 or (800) 367-5363.

*Dean Herzfeld, Coordinator
Health, Environmental, and Pesticide Safety Programs*

CROP PRODUCTION SCHOOL

A Crop Production School featuring Plant Diseases and Soil Fertility will be held in January. This school will focus on the fundamentals of both subjects. The various topics will be delivered by several faculty members of the University of Minnesota. This information will be delivered with the use of Interactive TV.

The School will be held at three locations:

1. Studio A on the Morris Campus of the University of Minnesota
2. Room 4 in the St. Paul Campus Library at the University of Minnesota, St. Paul
3. Room ST 118 at the Continuing Education Center at Rochester.

Eight, 2 1/2 sessions (4 in Soil Science, 4 in Plant Diseases) are planned. Those who attend this school

should have a good understanding of some fundamental principles in soil fertility and plant diseases when they finish. Application for appropriate CEU credits in the Certified Crop Advisors program has been completed.

Those who want more information or registration materials should call:

Tracy Benson
(612) 624-3708
or
1-800-367-5363

Pre-registration is required.

*George Rehm
Extension Soil Scientist*

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Thank you for your interest in our newsletter.

PLANT DISEASE CLINIC

Samples submitted to the Plant Disease Clinic in November included:

soybean—soybean cyst nematode,

Phytophthora sp race ID testing on samples collected this summer. Races 1 and 4 were identified.

impatiens—Tested for Tomato spotted wilt virus & Impatiens necrotic spot virus

poinsettia—no disease observed

hydrangea—*Botrytis* sp stem rot

geranium—tested for *Xanthomonas campestris*, bacterial wilt

rose—*Paratylenchus* sp and *Pratylenchus* sp nematode, *Botrytis* sp stem decay

Sandra Gould
Plant Disease Clinic

GRAY LEAF SPOT

Another corn disease to watch in 1996. Gray leaf spot or Cercospora leaf spot, caused by *Cercospora zea-maydis*, was reported in much more of Minnesota in 1995 than before. This south eastern corn belt disease was seldom seen in any parts of Minnesota until 1993 and 1994. At least three independent isolations of the fungus in 1995 and multiple reports of this problem from a much wider area of our corn growing area indicated this disease is now established in Minnesota.

The fungus overwinters in corn leaf and stalk debris. Fungal activity, sporulation begins with spring warm weather or later during periods of high humidity or frequent rains. The symptoms in 1995 did appear to develop late in the season and no one has suggested that yield was reduced. Plant can become infected early, four leaf stage until mature. Spots begin on the lower plant leaves and progress up the plant. Extensive blighting of leaves is followed by stalk breakage and increased lodging.

The symptoms are different than most leaf spots seen in Minnesota in that the leaf veins limit the spot giving it a square or rectangular look, not rounded. The parallel sides or straight edges are common in most hybrids. When the leaf tissue dies the lesion has a grey appearance, but they start as tan to pale brown spots.

This disease has a history of being more common and serious in fields of continuous corn, especially in no-till. Problem fields are often reported in river bottom or low-lying areas where dew and fog provide the moisture needed for an epidemic. The history of this disease in Minnesota will be developed in the next few years. I expect it will follow the pattern reported, being more severe in the high residue, continuous corn sites in low areas, but also appearing in additional no-till fields when the weather permits wind blown spores to be dispersed. Tillage and crop rotation(one year) are control options, but if not possible you must depend more on variety/hybrid resistance.

This disease is now believed to be much more wide spread in Minnesota than in 1994. Corn growers who produce continuous corn in reduced till fields with a potential for long morning dews or fogs should determine the resistance/susceptibility of the hybrids they plan to grow. Contact your county University office if you have seen this problem.

Ward C. Stienstra
Extension Plant Pathologist

SOIL MOISTURE FALL 1995

Soil moisture in the topmost 5 feet is generally greater than last year's levels in most counties except portions of southern Minnesota where it is near the same levels as last year. Average storage in terms of available water is between 7 and 9 inches for many soils. For western Minnesota counties, this is 25 to 35 percent above normal.

In addition, the levels of lakes, streams, and shallow aquifers are higher than normal in many watersheds. Unusually cold early winter temperatures have moved the soil frost layer down to 10 to 15 inches in many exposed areas. Where soils are blanketed with substantial snow cover, the frost layer remains at 5 to 8 inches.

These signs all point to the fact that abundant moisture will have to be drained from the landscape before the 1996 spring field conditions are suitable for tillage and planting. Overwinter soil frost penetration will be one of the keys to this event. Deeper than normal frost will prolong the thawing period and produce higher volumes of runoff this spring. The first spring flood potential outlook will be released by the North-Central River Forecast Center on February 16, 1996.

Mark Seeley
Extension Agricultural Climatologist

VERDE, NEW SEMIDWARF HARD RED SPRING WHEAT VARIETY

Released from Minnesota

Verde, a new semidwarf hard red spring wheat variety, was cooperatively developed and released by the Minnesota Agricultural Experiment Station and the Agricultural Research Service of the U.S. Department of Agriculture. Verde was released in the spring of 1995, and 1335 acres of certified and 703 acres registered seed were produced by Minnesota seed producers in the summer of 1995. Thus, a substantial quantity of seed is available for 1996 plantings. Verde was released because of its high yield in both northern and central Minnesota, desirable agronomic traits, disease resistance and acceptable bread-making quality.

Hybridization and some selection was conducted by Pioneer Hi-Bred International and further selection and evaluation were done at the University of Minnesota by Robert Busch, USDA plant breeder, Donald McVey, USDA plant pathologist, and Gary Linkert, Agronomy and Plant Genetics Department, University of Minnesota. Branch experiment station agronomists John Wiersma and Dennis Warnes collaborated in testing this new variety.

History of Verde

Verde originated from a cross of MN7663 and SBY354A. MN7663 is an elite Minnesota breeding line, closely related to the old variety Era. SBY354A is a Pioneer Hi-Bred breeding line that originated from crosses of Waldron, Lundi, Justin, Tala and an Argentina line. Verde originated as a head selection in the Pioneer Hi-bred spring wheat breeding program. Testing was initiated in the USDA-ARS, University of Minnesota program in 1991. Verde was tested in state-wide trials in 1992-95.

Agronomic Characteristics and Performance

Verde is a semidwarf variety with good resistance to lodging similar to the older variety Marshall but better than 2375 or Grandin. It is similar in height to 2375, but slightly shorter than Grandin. Verde is 2 days later than 2375 and Grandin but 1 day earlier than Marshall. Verde is moderately resistant to leaf rust, resistant to stem rust and moderately susceptible to loose smut. Verde is moderately susceptible to scab and expresses relatively low spread of scab in the spike. It maintains yield under severe scab infection better than Grandin but not as good as 2375. It is similar to Marshall in scab reaction. Compared to 2375 and Grandin, Verde is 3 and 1% lower in test weight, respectively. Verde possesses good green leaf retention late in the season, thus the name Verde, which is the Spanish word for green. In statewide yield trials in 1992, with little scab present, on statewide average, Verde yielded 10 and 12% better than 2375 and Grandin, respectively. In the statewide yield trials from 1993 through 1995 in 18 environments, Verde yielded 10% more than Grandin but 4% less than 2375. Scab was prevalent in all 3 years of testing.

Grain Quality

Bread-making properties of Verde were judged acceptable in USDA Spring Wheat Quality Laboratory, Fargo, ND tests during 4 years and in 2 year industry evaluations. Verde is about 0.3 percentage points higher than Marshall in grain protein content but 1.0 to 1.3 percentage points lower than 2375 and Grandin, respectively. Flour yield is lower than Marshall but higher than 2375 and Grandin, and water absorption of the flour is higher than Marshall but lower than Grandin. Verde has strong mixing characteristics and is stronger than Marshall but somewhat weaker than Grandin. Loaf characteristics were judged similar to Grandin. Overall, the milling and baking quality is intermediate, similar to 2375.

E.A. Oelke, R.H. Busch, and J.J. Wiersma
Agronomy and Plant Genetics

NEW INSECT PEST MANAGEMENT COURSE: JANUARY - MARCH 1996

Dr. Ted Radcliffe and I will be team-teaching Insect Pest Management during winter quarter (Jan. 2nd - March 16th) 1996, on the St. Paul Campus, University of Minnesota. Dr. Radcliffe has been teaching this course for 30 years and has developed a variety of creative methods for learning IPM. Many of you may be interested in this course.

This coming year we have made 2 changes to the course that may make this course more accessible to "non-traditional" students, specifically those of you working as crop consultants, seed company representatives, agronomists, ag-chem dealers, and living within the Twin Cities "Region": 1) we changed the time to late afternoon, from 3:30 - 4:40 pm, Mon., Wed., and Friday, and 2) we are making all of the lectures available on the World Wide Web (WWW), via Internet access available with your PC (accessible by Mac or IBM compatible PCs).

For many reasons, we believe having the "IPM Electronic Text" available on the WWW will provide a useful, innovative and convenient way to facilitate learning. We are placing numerous lectures (now nearly 70 lectures in progress) covering all key principles of IPM (e.g., economic thresholds, sampling, insect migration) and many examples of IPM programs (field and vegetable crops, forest systems, tropical crops, etc.) for off-site viewing and review. Each lecture (chapter) has been written by nationally and internationally known researchers, teachers, extension specialists and leaders within industry (ag-chemicals, processing, etc.). Each lecture will also make liberal use of photographs, figures and drawings to complement the text.

There are many advantages to having an "IPM Electronic Text" (vs. traditional text), including the ability to add new lectures without space limitation requirements, and the ability to easily update lectures with recent research information (e.g., at least yearly). Clearly, this resource will not be limited to this course; this "IPM Text" will be available world-wide to a diverse audience, including those who may be teaching IPM at other institutions.

Course Description at Minnesota: The following is adapted from the University of Minnesota Course Guide, Winter 1996. "In ENT 5210, we examine the philosophy and implementation of insect pest management, an essential component of most Integrated Pest Management

(IPM) and Sustainable Agriculture systems. Insect pest management can be defined as the practice of preventing or suppressing damaging populations of insect pests by application of the comprehensive and coordinated integration of multiple control tactics. Tactics include the various control methods, e.g., chemical, biological, cultural, and plant resistance (including the impact of Bt-transgenic crops such as corn and potato). Strategies are the planned manipulations undertaken to optimize the dynamic integration of control methods in the context of their economic, environmental and social consequences. The philosophy is holistic, but deeply rooted in applied ecology. In this course, we survey various control tactics and consider strategies for optimizing their integration into insect pest management programs."

Although we have plans for providing complete long-distance delivery of this course to greater Minn. in the future, the course presently requires attendance at the lecture/discussion site at 490 Hodson Hall, St. Paul Campus (please note: parking may be a challenge). However, by providing the course text via the WWW, we are expecting students to have read the key lectures in advance of the class, to allow for the most effective discussion of key IPM principles during each class hour (approx. 60% lecture; 40% discussion). We emphasize considerable oral review and discussion among faculty and students. A popular project for the past 4 years has been the development of an IPM Expert System (Computerized Decision Aid) for a given crop; we will do this again in 1996.

For complete information about the course, you can access the WWW IPM home page at:

<http://www.ent.agri.umn.edu/academics/classes/ipm/ipmsite.htm>

You may also contact Ted Radcliffe:

(624-9773; e-mail:
RADCL001@maroon.tc.umn.edu)

for course information, or contact Bill Hutchison

(624-1767; e-mail: hutch002@maroon.tc.umn.edu)

for information about options for CCA or CPCC CEUs for those interested in maintaining certification. Also note the University deadline for registration for Winter Quarter is Dec. 29, 1995.

*Bill Hutchison
Extension Entomologist*

DIAL U

Dial U is a user-fee telephone diagnostic clinic for calls and samples related to gardening, landscapes, plant diseases, insects and wildlife associated with the home environment. Calls from the public are taken at 1-900-988-0500 weekdays. A flat \$2.99 charge is billed automatically to the phone from which the call is placed.

Christmas Tree Questions

Every year Dial U gets calls about keeping Christmas trees in good shape; usually the caller wants a recipe for some sort of special preservative solution to keep the needles flexible and reduce their flammability. Unfortunately, there's no magic potion — home-made or otherwise — that we can recommend.

The best way to keep the tree in good shape is to start out with a good fresh tree to begin with, and make sure it is always well-watered. Make a fresh cut immediately before setting the tree in a stand that holds plenty of water. Start out with warm water and a spotlessly clean stand.

Check the stand twice daily; fresh cut trees can use an amazing amount of water in a warm, dry room. Never allow the container to dry out; the cut on the bottom of the stem will dry and the tree won't take in more water until you re-cut the trunk — an impossible task on a decorated tree.

Another question we get from time to time has to do with using a potted evergreen (a "living Christmas tree"), then planting it outdoors immediately after the holidays. Although this works quite well in milder climates, it is a very poor idea for Minnesota, even when you dig the hole ahead of time and keep the tree indoors for just a few days.

The problem is that warm indoor temperatures bring the tree out of dormancy, and then it just can't make the transition to our cold outdoor conditions. Neither can it be kept growing indoors until it's warm enough to transplant next spring. Buy a cut tree instead, or decorate a Norfolk Island Pine if you can get by with a smaller tree. Norfolk Island Pines are nice houseplants that should thrive for years indoors, given good growing conditions.

Finally, as to the question of what to do with your tree when you're done with it and it's starting to shed, take it outdoors and cut off the branches to use as mulch over bulb and perennial beds. You could also use branches to form a sunscreen or shield in front of yews or young evergreens that tend to "burn" in winter.

Calendar Reminder

The Minnesota Gardening calendar makes a great last minute gift for all your gardening friends and relatives. You can order the calendar in the Twin Cities Metro area by calling 624-4900. Outside the Twin Cities, call 1-800-876-8636 (credit card sales, only). You can also find them at county Extension offices, nurseries, book and gift shops throughout the state.

*Deborah Brown
Extension Horticulturist*

Entomology Calls

The volume of calls has declined with the cold weather. Of the calls we are receiving, most are indoor insects, primarily stored food insects such as Indianmeal moths, houseplant insects, carpenter ants and flies (including fruit flies and drain flies).

We also have been receiving a fair number of calls of people receiving unknown bites. It is worth checking out the more likely insect suspects, namely fleas, lice or bed bugs. However, in most of the cases we have seen, no insects or arthropods have been found. We suspect the cause is not related to insects but is more likely environmental, e.g. dry air or an allergic reaction to something.

*Jeffrey Hahn
Asst. Extension Entomologist*

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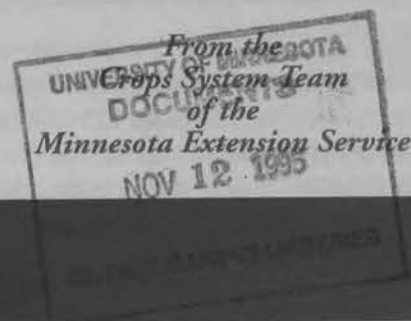
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CROP

NEWS



Conservation Reserve Program Land Rent

Significant questions face CRP land owners. Following the contract expiration, what is CRP land worth for crop production? What is a fair rental value for post CRP acres?

A significant percentage of CRP acres are owned by individuals or heirs of the original owners who have neither the desire nor the ability to farm the land themselves. If those acres are returned to crop production, it will be done by a renter. What is a fair cash rent for post CRP acres? How do share rent arrangements compare? Regardless of the rental arrangement, should the land owner or renter be responsible for "reclamation" costs? Reclamation costs can be defined as expenses associated with the elimination of weeds and vegetation, leveling of gopher mounds and the reestablishment of conservation practices.

The Lincoln County CRP research and demonstration project by the Minnesota Extension Service is designed to answer some of these questions. The project began in 1995 with four crops planted with tilled and no till. It seeks to duplicate potential scenarios that land owners and operators may face when converting CRP acres to crop production.

One of the project scenarios illustrates the cash rent issue. This scenario has corn, soybeans and wheat planted. Average cost of the variable inputs, which do not include return for labor management and land, are \$108 per acre. Projecting historically normal crop yields and prices, the gross return would be \$168 per acre.

In this scenario, \$60 per acre remain to pay cash rent. This should be considered a maximum amount, since

there is no allowance for lower than normal yields or return for management. This scenario also assumes that the land owner applies the burn down herbicide at his or her own cost. The justification for this assumption is that the burn down herbicide is a cost attributable to CRP, rather than crop production. It is necessary to bring the land into rentable condition and is therefore the land owner's responsibility. If the cost of the burn down herbicide, including application, will be \$30 per acre and the renter is responsible for any or all of the burn down

Highlights...

November 10, 1995

Conservation Reserve Program Land Rent

Plant Disease Clinic Report

Nitrogen Losses From Denitrification

Late Season Reflections

Dial U

Pruning Trees

1995 Minnesota Gardening Calendar

Fruit Flies

Winter Ticks

Subscription Form For The Minnesota Crop News Newsletter — 1996-97 Season

herbicide application, then the amount of rent that can be justified should be reduced accordingly for the first year of the rental contract.

Share rental arrangements which would be appropriate on this land would be a two fifths/three fifths or a one third/two thirds arrangements. The issue of the burn down application still needs to be addressed, either by

sharing the cost proportionately between land owner and renter or by the land owner assuming all costs.

Additional information on rental arrangements and on the Lincoln CRP project is available at the Extension Office.

Bob Byrnes
Extension Educator

Plant Disease Clinic Report

Samples submitted to the clinic in October included:

soybean—soybean cyst nematode
spruce—*Rhizosphaera* sp needlecast
oak—Oak wilt
viburnum—*Verticillium* wilt
rose—*Coniothyrium* sp canker, *Pythium* sp root rot, *Pratylenchus* sp and *Paratylenchus* sp nematode
turf—*Tylenchorhynchus* sp nematode

garlic—*Fusarium* sp bulb rot
dogfood—mold ID
cineraria—*Impatiens* necrotic spot virus
cyclamen, N.G. *impatiens*, chrysanthemum and poinsettia were assayed, but diseases were not identified.
soil samples were assayed for *Verticillium* sp

Sandy Gould
Plant Disease Clinic

Nitrogen Losses from Denitrification

The recent wet weather followed by below normal freezing temperatures has forced many farmers to change their plans for nitrogen management for the 1996 growing season. The cold, wet soils make application of anhydrous ammonia very difficult, if not impossible. There appears to be substantial loss in application in fields where some have been applying anhydrous ammonia this past week. So, thoughts have turned to the use of urea as an alternative nitrogen source for application this fall.

Urea, if used, would be applied to wet soils where incorporation with some tillage implement would not be possible. Therefore, there is a common concern about nitrogen losses either from volatilization and/or denitrification.

Denitrification is an avenue for potential nitrogen loss when nitrate-nitrogen is applied to the soil. The process is generally described as follows:

nitrate nitrogen → nitrite nitrogen → nitrogen gas
or nitrous oxide

Microorganisms are responsible for this loss mechanism. Therefore, soil conditions which favor the growth

of microorganisms favor the denitrification process. This method of loss is affected by soil pH, moisture level, oxygen concentration in soil air, and temperature. This process will not take place in soils unless their temperatures are appropriate for bacterial growth. Favorable temperatures are approximately 50oF and warmer.

Unless soil temperatures warm dramatically, loss of nitrogen due to denitrification from broadcast urea should not be a major concern this fall. However, denitrification will take place if soils warm and remain saturated next spring.

Urea should not be broadcast on frozen soils which will remain frozen throughout the winter. Urea dissolves easily in water and will move with snow melt unless attached to soil particles. Such a broadcast application of urea to soil that is now frozen is not suggested, unless much warmer temperatures, to allow for some thawing, are predicted.

Volatilization of nitrogen from urea is a concern unless the urea dissolves and moves into the top 1/2 to 1 inch of soil. Incorporation by tillage is not practical. Therefore, we must rely on moisture for incorporation.

There is some possibility that temperatures may yet

go above freezing this fall and allow for some thawing during the day. If this happens, broadcast urea will dissolve and move into the top 1/2 to 1 inch of soil. This would allow urea to convert to ammonium nitrogen and become attached to soil particles preventing the loss in runoff water.

Those still thinking about applying urea this fall should check the best management practices for nitrogen for their area (copies available in County Extension Office). Fall application, regardless of soil conditions, is

not suggested for sandy soils and soils in southeastern Minnesota.

It's also important to remember that nitrogen fertilizer can be applied in spring or as a sidedress application as a substitute for fall application. There are several flexible options that can be used. Unless the weather improves dramatically, it may be wise to delay nitrogen applications until next year.

*George Rehm
Extension Soil Scientist*

Late Season Reflections

Late season reflections on crop diseases, and next year's crop plans, suggest that while 1995 was a good year, several diseases were consistently present, and are not expected to go away. We must recognize and develop management plans for these disease problems.

The most effective disease management tool is the selection of varieties or hybrids with genetic resistance. The need to select suitable resistant varieties is becoming more important as other basic management tools of disease prevention are being removed from the crop production system, such as with our move towards shorter rotations and the use of less tillage.

The development of corn leaf diseases (Gray Leaf Spot, Eyespot and Northern) over the last several years is an example of the changing set of disease problems facing growers. Soybean growers may be finding increased leaf disease also (Downy Mildew, Septoria Brown Spot, Sclerotinia White Mold and leaf symptoms from the root and stem problems of Brown Stem Rot and Root Rot-SDS).

Because tillage systems are believed to be an important factor in producing this changing set of problems, producers must increase their dependence on other dis-

ease management alternatives. Selection of varieties with genetic resistance is one method of improving the crop performance. Soybeans with Cyst Nematode resistance have, in infested fields, nearly always out-yielded those that are susceptible.

The use of lines with resistance is a mixed bag, as some are quickly selected and grown, while others are ignored. Sales of soybeans with Cyst Nematode resistance are low, suggesting that growers are either uninformed or unwilling to try new varieties. By contrast, in White Mold problem fields, many growers have grown or are considering those lines that have performed well in past White Mold sites, even if that Sclerotinia resistance can be overcome.

Today a grower must, I believe, be better informed and quicker to change crop varieties in order to grow what is suitable for his or her local problems. Resistance may not always be available to the disease or diseases you are concerned about, but its presence or absence should remain an important factor in the selection of crop varieties suitable for your needs.

*Ward C. Stienstra
Extension Plant Pathologist*

DIAL U

Dial U is a user-fee telephone diagnostic clinic for calls and samples related to gardening, landscapes, plant diseases, insects and wildlife associated with the home environment. Calls from the public are taken at 1-900-988-0500 weekdays. A flat \$2.99 charge is billed automatically to the phone from which the call is placed.

Pruning Trees

Now that oaks, elms and other shade trees are dormant, they may be pruned safely. It's too early, however, to prune fruit trees. For those, wait until late February or March, when the onset of spring weather and rising sap will help wounds heal fairly rapidly. When you prune

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fruit trees this early, they're more likely to suffer desiccation (drying) and die-back at the wound sites.

Unless you're contemplating removing only a few small branches, it makes good sense to engage an established, qualified tree care company to do the work for you. They are insured and bonded, and are far less likely to injure themselves.

If you have young shade trees that need shaping, hold off until they've been in your landscape several years. For their first few years, they need to keep all the leaves they can grow in order to produce plenty of "food" to help them develop a good root system. Pruning them too soon limits the amount of foliage and hampers their ability to become established.

1995 Minnesota Gardening Calendar

Again, let us remind you that the Minnesota Gardening calendar makes a great hostess gift at Thanksgiving, and a welcome holiday gift for anyone who enjoys plants and gardening. It's reasonably priced, beautifully illustrated with original photography, and chock full of good information for northern gardeners.

Purchase a copy from your local gift or book store, or order them from your county extension office. You can also call the University's Distribution Center directly at 1-800-876-8636, (624-4900 in the Metro area) for credit card orders.

*Deborah Brown
Extension Horticulturist*

Fruit flies

This has been a popular topic with callers since the end of summer. Fruit flies are usually small (about 1/8 inch long), often have red eyes, have a tannish head and thorax, and have an abdomen that appears to be striped. If you're still not sure if you have fruit flies, someone familiar with fly venation needs to examine the wings to verify which fly it is (there are several other small-sized flies that may be confused with fruit flies; submit a sample if there's any doubt as to the identity of the insect).

Fruit flies go through a complete life cycle, i.e. egg, maggot (larva), cocoon (pupa), and adult. Maggots feed on moist decaying or fermenting organic matter. Fruit flies can go through one complete life cycle in as little as eight days. It is not uncommon for large numbers of fruit

flies to suddenly appear.

The best control of fruit flies is to find and eliminate their food source. While this sounds easy and straight forward, in practice it can be challenging. First check for any fruits or vegetables (unrefrigerated) that may have been left undisturbed for a while. Also check garbage containers and be sure they are kept cleaned. Soft drink, juice, wine or vinegar residue, particularly in discarded containers, can also provide a favorable site for fruit flies to lay eggs.

Although a less common food source for fruit flies in homes, it is possible that food may be swept into drains or cracks and crevices. If that site is kept moist, it can provide a food source. The same is true of mops used to clean up food and then stored away dirty (and moist). A lot of times, the source of the infestation is near where fruit flies are most numerous. However, this is not always true so a thorough inspection is necessary.

Be persistent. While checking for food sources that already exist, be sure that you do not create any additional sites for them to infest. The use of insecticides is generally not suggested. As long as there is a food source available, spraying flies is only temporary.

Winter Ticks

Winter ticks, *Dermacentor albipictis*, are also known as elk ticks, moose ticks, and horse ticks. We have received a couple of samples recently from northern Minnesota (Kittson and St. Louis counties). They are interesting because they are active during winter when ticks are usually dormant.

Eggs of these ticks are laid in spring. They hatch into immature larvae in about three to six weeks. They remain inactive until the first cold weather in fall. Then the ticks actively search for a host to feed on such as horses, moose, elk, or deer. They spend their entire life cycle on one animal, taking a total of three meals (this differs from ticks such as American dog ticks and blacklegged ticks which take their three blood meals on three different animals). After adult females are finished feeding, they drop off their host and wait until spring to lay eggs. Winter ticks are not known carriers of Lyme disease.

*Jeffrey Hahn
Assistant Extension Entomologist*

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CROP

From the
Crops System Team
of the
Minnesota Extension Service



Flexible Cash Rental Arrangements

The 1995 Farm Bill is likely to lower potential deficiency payments to farmers on government program crops, such as corn or wheat. The Farm Bill may also lower CCC loan rates on corn, soybeans, and wheat in order to meet Federal budget guidelines. The resulting effect to individual farmers will be a reduction of the "safety net" that is provided on grain prices by deficiency payments and crop loan rates.

Cash rental rates have been very strong in many areas. This has been due in part to the grain price "safety net" provided by government program provisions. If that "safety net" is eroded, the farm operations that pay very high cash rental rates could be increasing their financial risk. This may cause some farm operations and ag lenders to evaluate the amount of cash rent being paid.

One alternative that may allow farm operators to absorb the extra risk is to switch from straight cash rent to a flexible cash lease. The final cash rental rate in a flexible lease is usually adjusted upward or downward depending on actual crop yields and/or actual grain prices. The flexible lease approach results in a farm operator paying higher final cash rents in years when crop yields and prices are more favorable and to pay lower rental rates when yields, prices, and profits are reduced. The flexible lease allows farm operators and landlords to share in the production and price risk, as well as the benefits associated with crop production.

In order to establish a flexible lease, the farm operator and landlord must agree on a base cash rent, a base yield, and a base price. The average cash rent in an area or the current rental rate could be used as a base rent. Five- to ten-year average yields or proven Federal Crop Insurance yields on a particular farm could be used as base crop yields. A projected harvest price or the new crop grain price in early April could

represent the based price. It is important that the method of determining base rental rates, yields, and prices be agreed upon by landlords and farm operations when the rental agreement is signed.

Another major component of flexible cash leases is to determine how final yield levels and grain prices will be determined. Actual grain weights, bin measurements, and yield

Highlights...October 20, 1995

Flexible Cash Rental Arrangements

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Who Will Farm The Post CRP Acres?

When and What After CRP

Successful Transition From CRP To Crop Production

Anhydrous Ammonia And Soil Properties

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Millipedes

Ant Swarms

Are They Voles, Moles, or Shrews???

Voles can be a winter problem

Sooty Blotch and Flyspeck Evident On Apples

Cash Rental Arrangements/Continued

samples are all methods to establish harvest yields. The final grain price could be the harvest price on a certain date or an average price from April 1st (or established planting date) to October 31st (or established harvest date). Again, it is very important that landlords and farm operators agree on

the method for determining the final yield and price when the initial rental agreement is signed.

The following are some examples of flexible lease agreements that are currently being used:

1. Adjusting Rent Based on Yield Only

$$\text{Base Rent} \times \frac{\text{Actual Yield/Acre}}{\text{Expected Yield/Acre}} = \text{Adjusted Cash Rent}$$

$$\text{Corn Examples: } * \$90/\text{Acre} \times \frac{160 \text{ Bu./Acre}}{140 \text{ Bu./Acre}} = \underline{\$102.86/\text{Acre}}$$

$$* \$90/\text{Acre} \times \frac{120 \text{ Bu./Acre}}{140 \text{ Bu./Acre}} = \underline{\$77.14/\text{Acre}}$$

2. Adjusting Rent Based on Price Only

$$\text{Base Rent} \times \frac{\text{Actual Price/Bu.}}{\text{Expected Price/Bu.}} = \text{Adjusted Cash Rent}$$

$$\text{Soybean Examples: } * \$90/\text{Acre} \times \frac{\$6.00/\text{Bu.}}{\$5.50/\text{Bu.}} = \underline{\$98.18/\text{Acre}}$$

$$* \$90/\text{Acre} \times \frac{\$5.10/\text{Bu.}}{\$5.50/\text{Bu.}} = \underline{\$83.45/\text{Acre}}$$

3. Adjusting Rent Based on Yield and Price

$$\text{Base Rent} \times \frac{\text{Actual Yield}}{\text{Expected Yield}} \times \frac{\text{Actual Price}}{\text{Expected Price}} = \text{Adjusted Cash Rent}$$

$$\text{Corn Examples: } * \$90/\text{Acre} \times \frac{160 \text{ Bu./A.}}{140 \text{ Bu./A.}} \times \frac{\$2.10/\text{Bu.}}{\$2.25/\text{Bu.}} = \underline{\$95.42/\text{Acre}}$$

$$* \$90/\text{Acre} \times \frac{110 \text{ Bu./A.}}{140 \text{ Bu./A.}} \times \frac{\$2.50/\text{Bu.}}{\$2.25/\text{Bu.}} = \underline{\$78.92/\text{Acre}}$$

$$\text{Soybean Examples: } * \$90/\text{Acre} \times \frac{48 \text{ Bu./A.}}{42 \text{ Bu./A.}} \times \frac{\$5.20/\text{Bu.}}{\$5.50/\text{Bu.}} = \underline{\$97.47/\text{Acre}}$$

$$* \$90/\text{Acre} \times \frac{35 \text{ Bu./A.}}{42 \text{ Bu./A.}} \times \frac{\$6.00/\text{Bu.}}{\$5.50/\text{Bu.}} = \underline{\$81.42/\text{Acre}}$$

4. Fixed Payment Plus Harvest Payment

$$\text{Corn [Base Rent} \times .50] + [\text{Harvest Yield} \times \$0.35/\text{bu.}] = \text{Adj. Cash Rent}$$

$$\text{Soybean [Base Rent} \times .50] + [\text{Harvest Yield} \times \$1.25/\text{Bu.}] = \text{Adj. Cash Rent}$$

$$\text{Corn Examples: } * [\$90 \times .50] + [160 \text{ Bu./A.} \times \$0.35/\text{Bu.}] = \underline{\$101/\text{Acre}}$$

$$* [\$90 \times .50] + [125 \text{ Bu./A.} \times \$0.35/\text{Bu.}] = \underline{\$88.75/\text{Acre}}$$

$$\text{Soybean Examples: } * [\$90 \times .50] + [48 \text{ Bu./A.} \times \$1.25/\text{Bu.}] = \underline{\$105/\text{Acre}}$$

$$* [\$90 \times .50] + [30 \text{ Bu./A.} \times \$1.25/\text{Bu.}] = \underline{\$82.50/\text{Acre}}$$

Hints For Flexible Leases

1. Establish base rent, yields, and prices when rental contract is signed.
 2. Establish method for determining final yield and price when rental contract is signed.
 3. Establish a maximum and minimum cash rent per acre with flexible leases.
(Example: = \$15.00/Acre and -\$15.00/Acre compared to the base rent.)
 4. Maintain open communications and trust between the farm operator and landlord.
-

*Kent Thiess
Extension Educator*

The Future of CRP Acres

Over the next three years, 1,489 Conservation Reserve Program contracts covering 100,135 acres in the six counties of Southwest Minnesota will expire. Much speculation surrounds what will happen after CRP. Some acres may stay in permanent vegetation for environmental or wildlife purposes. Some acres may return to agricultural production similar to the production from which it was retired a decade ago.

If, following the expiration of Conservation Reserve Program (CRP) contracts, the land covered by those contracts returns to agricultural production, numerous agronomic management questions will arise. However, more basic questions will shape the decision making process. Questions like: Who? When? What? and How? These questions will be addressed in this column and in columns over the next several weeks.

Who Will Farm The Post CRP Acres?

What happens to CRP acres once contracts expire likely will be influenced by the characteristics of the CRP parcel as well as the contract holder. According to a nationwide survey of 2,000 CRP landowners, the average age of CRP contract holders in 1995 is 62 years. In Minnesota, 19 percent of the CRP contracts involved the enrollment of the entire farm. Whether the contract holder returns the CRP acres to production may be dependent on the contract holder's age, health, retirement plans, machinery availability and desire to increase the individual farm enterprise. Assuming that some of the CRP acres will be returned to crop production, there likely will be changes in the land rental and sales market as well as the need to develop creative rental arrangements. The increased amount of land which could come onto the rental market will likely have a depressing effect on the rental market, particularly in those areas with high concentrations of CRP acres. While this scenario may cause some pain for the land owners, it may also provide some opportunity for beginning farmers or farmers seeking to expand their farm operation.

Determination of a fair rental rate may be difficult, particularly in the first year of crop production following CRP. Costs for weed control, insect management and seed bed establishment will be high in the first year post CRP. In addition, crop yields may be variable and unpredictable in the year of transition from CRP.

The land owner may want to acknowledge the cost of transitioning the land from CRP to crop production by reducing the cash rent for the transitional year or by paying the cost of the burn down herbicide treatment. The landowner's interest is not only the rental rate, but in developing a good landlord/renter relationship.

When And What After CRP

The question of timing will be a factor in the transition of CRP to crop production. When does the contract expire? When will weed control as well as other practices begin? If the land is to be rented, when will the renter be determined?

CRP contracts expire on September 30 of the expiration year, which means that chemical spraying and tillage can occur after that time. In 1995, the State CFSA Committee

allowed chemical spraying or tillage anytime in September for 1995 expiring contracts. The State CFSA Committee also indicated that they would establish a policy for CRP contracts expiring in 1996 and future years. Such a policy would help in the transition of CRP acres. Successful transition may require mowing of the CRP vegetation in mid summer, application of a non-selective herbicide to the regrowth, and biomass incorporation following successful vegetation control.

Fall seeded crops such as winter wheat or alfalfa may be an option to plant in the year of contract expiration. Current rules provide greater latitude for preparation and planting of fall seeded crops.

For CRP acres which will be rented, it is important to have the rental arrangement secured in advance of the contract expiration so weed control and other practices can occur in a timely manner. Producers planting spring seeded crops will be at a distinct disadvantage if weed control and biomass management have not been addressed in the previous fall.

What crops should be planted in first year post CRP? The crop choice will likely be dictated by the history of crops grown on non-CRP land, cost of production in the CRP to production transition and equipment availability.

Small grain, either wheat or oats, may be a possible choice. Small grain offers the advantage of lower input costs and could be viewed as a transitional crop between CRP and corn or soybeans. However, weed control may pose a formidable challenge. Perennial grasses such as quack grass or brome must be eliminated before growing small grains. There are very few, if any, effective herbicides for controlling perennial grasses in small grain. This means that the perennial grasses must be eliminated the fall prior to spring planted oats or wheat. Corn and soybeans have more weed control options available, and may be the most likely crop choice for post CRP crop production. However, input costs for weed control, fertility and insect control will be higher than small grain. The potential for wire worm damage to corn may require a corn insecticide seed treatment. Since soybeans have not been grown on the CRP acres for a decade, an inoculum seed treatment for soybeans is necessary to ensure modulation.

Alfalfa may be a good choice if alfalfa production fits into the producers farming operation. Alfalfa offers an obvious advantage of maintaining erosion control. However, perennial grasses and broadleaves like quack grass and Canadian thistle must be controlled. In addition, pocket gophers may be a problem since pocket gophers prefer to inhabit alfalfa stands.

All the traditional crops as well as non-traditional crops not mentioned here offer opportunities and challenges in production following CRP.

Successful Transition From CRP To Crop Production

How can Conservation Reserve Program (CRP) acres be returned to crop production? Successful transition from CRP to crop production will involve a complex mix of agronomic

CRP Acres/Continued

and conservation issues. One of the original goals of the CRP was reduction of erosion. Care should be taken that those conservation benefits are not lost when converting those acres from long term retirement to crop production.

Producers should carefully evaluate which acres can be realistically converted to crop production without erosion or other environmental problems. Some CRP acres should not be converted to crop production. Other acres should have conservation practices installed as part of the transition to crop production. Grass water ways may need to be re-identified and conservation compliance should be considered. Producers should be in close contact with their local NRCS and SWCD offices.

One of the questions producers will face is whether to till or no till prior to planting. No till offers obvious erosion control benefits. However, producers must have proper equipment available to provide a seed bed which will allow adequate seed to soil contact. In addition, if the CRP acres have been inundated with pocket gophers, some leveling with a light disking may be necessary.

Primary tillage, most likely with a mold board plow, will effectively deal with the accumulated biomass and, with a follow-up tillage operation, provide a uniform seed bed which can be planted with common equipment. Care should be taken to re-establish water ways and buffer strips to reduce water erosion potential. Following the first year, primary tillage, conservation plans likely will include reduced or no tillage.

Regardless of the tillage decisions, the perennial weeds and vegetative growth must be eliminated. The most likely recommendation is to deal with this situation the season before production. Mid to late summer, mowing followed by a late September application of Glosophate (Roundup) to the regrowth should effectively kill the perennial grass and weeds. The herbicide rate will be the full two quart rate, which will cost approximately \$20.00 per acre. Troublesome patches of Canadian Thistle may need to be spot treated with Clopyralid (Stingor).

If timing does not allow weed control the fall prior to production, the producer should wait until spring regrowth begins and apply the burn down herbicide treatment. This scenario will result in delayed planting, which can result in reduced yields. There is a potential for soil insects in CRP ground to be harmful to planted seed and emerging crops. The most likely soil insect to be a concern is wire worm which can reduce corn populations. Insecticide seed treatments are recommended when corn is planted following CRP when high populations of wire worm are suspected.

When soybeans are planted following CRP, an inoculum should be used to treat the soybean seed. The inoculum contains the necessary bacteria to stimulate nodule development on soybean roots.

Bob Byrnes
Extension Educator

Anhydrous Ammonia and Soil Properties

Properties

Each year, anhydrous ammonia is used as economical source of nitrogen on a large number of acres in southwestern, west-central, and northwestern Minnesota. For several years, there have also been critics of the use of this nitrogen product. Using perception and emotion instead of facts, these critics have attempted to convince others that anhydrous ammonia makes the soil hard and "burns up" the soil organic matter.

In an effort to verify these claims, researchers at Kansas State University measured the effects of four nitrogen fertilizers on a variety of soil properties after annual applications for ten years. Each nitrogen fertilizer was applied at a rate to supply 200 lb. nitrogen per acre each year. The results are summarized in the following table.

Effect of repeated application of nitrogen fertilizers on selected soils properties.

Nitrogen Source	Organic Matter Content	Bulk Density
	%	gm/cm ³
none	2.3	1.31
82-0-0	2.3	1.34
33-0-0	2.4	1.30
46-0-0	2.4	1.31
28-0-0	2.4	1.31

Source: Kansas State University

Soil organic matter content was not affected by the use of nitrogen fertilizers. There was no change from the organic matter percentage measured in the soil that had not received the nitrogen fertilizer. It's obvious that the anhydrous ammonia did not "burn up" the organic matter in the soil.

Bulk density measurements are used as indicators of soil compaction. These measurements are reported as grams per cubic centimeter (gm/cm³). Compared to the non-fertilizer control, the use of the nitrogen fertilizers had no effect on bulk density. These results provide evidence for the fact that the use of 82-0-0 does not make soil hard.

If applied properly, anhydrous ammonia continues to be an excellent source of nitrogen for corn and small grain production. There is no research information to suggest that this product has a negative effect on soil properties.

George Rehm
Extension Soil Scientist

Crop Pest Management Short Course to be Held — November 14-15

The 15th Annual Crop Pest Management Short Course will be held Nov. 14 & 15 at the Earle Brown Center on the University of Minnesota St. Paul Campus. This course is designed to provide agricultural professionals with timely in-depth coverage of key issues.

Themes this year will include:

- Precision Farming: Promise and Reality.
- Weed Management Issues: Species shifts, Strategies and Herbicide Performance.
- IPM and Transgenic Plants: B.t. corn and Herbicide Resistant Crops.

Concurrent sessions will offer participants the choice of up to six of these nine topics:

Corn and Soybean Issues

1. European Corn Borer: What's in store for '96
2. White Mold in Soybean: Will 1996 repeat 1994 problems?
3. Improving Corn Stand with Seed Treatments

Small Grain, Sunflower and Potato Issues

4. Orange Blossom Wheat Midge: A new wheat pest
5. Sunflower Insects Rediscovering Old Threats
6. Implication of A₂ mating type on late blight in potato

CRP Conversion to Cropland

7. Tillage, Fertility and Agronomic Issues
8. Weed Management Issues
9. Insect and Disease Management Issues

A unique opportunity this year will be an optional evening session on The Internet and the World Wide Web: New Sources of Agricultural Information Class size for this session is limited to 20 people.

For those with CCA Certification, we have applied to the CCA Board for 12 CEU's.

For further information, contact Ken Ostlie or Lee Fields at (612) 624-9272 or Tracy Svec, Special Programs, at (612) 625-8215.

Plant Disease Clinic Report

Samples submitted to the clinic in September and the diseases identified included:

- alfalfa—*Pseudopeziza* sp. (common leaf spot) and *Leptosphaerulina* sp leaf spot
- barley—storage molds
- corn—*Cercospora* sp (gray leaf spot)
- soybean—*Phytophthora* sp root rot, *Sclerotinia* sp. (white mold), *Colletotrichum* sp (anthracnose), soybean cyst nematode
- crabapple—*Sclerotium* sp root rot
- daphne—*Phytophthora* sp root rot
- elm—Dutch elm disease
- oak—Oak wilt
- J. tree lilac—*Verticillium* wilt

- spruce—*Rhizosphaera* sp needlecast
- dogwood—*Colletotrichum* sp
- peony—*Rhizoctonia* sp stem rot, *Phyllosticta* sp leaf spot
- cineraria—*Impatiens* necrotic spot virus
- viola—*Colletotrichum* sp leaf spot
- geranium—*Xanthomonas campestris* (bacterial wilt)
- cyclamen—*Impatiens* necrotic spot virus
- turf—*Colletotrichum* sp (anthracnose), *Tylenchorhynchus* sp and *Trichodorus* sp nematodes

Sandy Gould
Plant Disease Clinic

Fall-Applied Dual

Ciba is promoting fall applications of Dual (metolachlor) herbicide creating interest and questions regarding the fit of fall-applied herbicides in Minnesota. Fall herbicide applications would allow applicators to spread their work load into the fall season, if the fall season permits. This is important considering the short window of opportunity to apply herbicides with spring time constraints for custom applicators and farmers to cover the large number of acres with the equipment and labor available.

The other promotional aspect being discussed regarding Dual applications in the fall is a benefit to the environment. I was perplexed and quite skeptical by this assertion at first glance. Upon reflection, consider that the most dramatic surface runoff events occur in the spring associated with severe,

localized thunderstorms when fields have relatively little plant or residue cover to protect soil, and occur in close temporal proximity to herbicide application. This results in the common detection of acetanilides such as Lasso and Dual, and triazines such as atrazine and Bladex in surface waters with peak detections occurring down stream in St. Louis and New Orleans during June or July. Theoretically, applications of a herbicide such as Dual in the fall would allow "natural" incorporation of the herbicide with rainfall events that typically are more frequent and less severe than with spring or summer thunderstorms, thus less prone to cause surface loss. Similarly, spring incorporation of herbicide, common in southwestern and south central Minnesota, would reduce the concentration of herbicide in runoff compared with spring

Fall-Applied Dual/Continued

preemergence applications. The EPA has often considered mandatory preplant incorporation of soil applied herbicides to reduce surface runoff. This has been controversial since actual benefits are dependent upon rainfall patterns and localized climatic events. Conceivably, with fall applications the cumulative annual loss of Dual to surface water could remain unchanged, with peak detections in June or July reduced but balanced with an increase in low level detections in late fall and early spring.

Dual should be applied after October 15th and when soil temperatures are below 50°F to reduce microbial degradation, analogous to the concept of applying anhydrous ammonia after the microbes that convert anhydrous to nitrate go "dormant". Also, Dual should be applied only to medium or clay textured soils with organic matter of 2.5% or more. Dual should not be applied after soil is frozen, much like the label restrictions for Velpar use on alfalfa, to reduce surface runoff. Dual should not be applied to sloping, saturated fields even if the soil temperature and calendar requirements can be met due to high potential for runoff.

Herbicide properties do influence how successful a fall-applied herbicide program might be. Treflan (trifluralin) has had fall-applied labeling for some time and is commonly used on other crops. Treflan is relatively persistent and immobile once mixed with soil. It will not be subject to leaching below the optimal zone for weed control and will likely not dissipate enough to reduce efficacy the following spring. Of the acetanilides, Dual is relatively persistent and has moderate solubility and adsorption such that it will move into the soil surface profile with activating rainfall. The other extreme would be an acetanilide such as Ramrod (propachlor) which

would not be a good candidate for fall applications (and is not labeled for fall applications). Ramrod simply dissipates too fast and would be too mobile to remain near the surface at concentrations to provide weed control the following spring.

A logical place to consider fall Dual applications would be to soybean stubble that will be no-till planted to corn the following spring. Fall applications of Dual would ensure activation of the herbicide by the time foxtail seedlings germinate in the spring, similar to early preplant applications. Beyond that, the challenge is to match fall and spring tillage needs or P and K fertilizer application if impregnated on fertilizer with optimum placement of the herbicide. Research conducted at Waseca and Lamberton has shown good and less than adequate performance for fall applications of Dual. Herbicide performance can be less than adequate with traditional spring applications as well. Situations less than ideal for fall-applied Dual would be extremely high grass pressures and specific species that are more difficult to control such as proso millet or woolly cupgrass.

In the final analysis, fall-applied Dual does have potential in Minnesota. The jury is still out as to whether there is any environmental advantage to fall applications of Dual. Dual is not the most economical soil-applied herbicide to use if you are going to plant soybeans the following spring. As with any weed management option, I would never put all of my management eggs in one basket. Always diversify the herbicide choices and methods of application within your farming operation to hedge against widespread failures due to localized environmental conditions. Likely, any one of the herbicides or methods of application will result in poor performance in a given season. Diversifying your management programs will give you the flexibility to get back to those troublesome acres in a timely manner to get rotary hoeing, cultivation, or follow-up herbicide applications made.

Roger Becker
Extension Agronomist - Weed Science

Dial U

October Calendar

In **early** October: You can still plant evergreens and lay sod, but it's too late to plant grass seed for successful fall germination and overwintering.

By **mid-month**: Protect tender roses (those that are not winter-hardy here), even though they may still have buds and flowers. (Pick the blossoms for a final fall rose bouquet.) Reliable methods of protection include mounding them with soil and mulch or tipping them into trenches, then covering them with soil and mulch. (See Extension factsheet FS-1105, *The Culture of Garden Roses*.)

Mid to late October: Put that final fertilizer application on your lawn. You need not buy a special "winterizing" product; a standard, high nitrogen fertilizer will work fine. Even through air temperatures are cool enough for grass topgrowth to really slow down, soil stays warm longer and those nutrients will encourage lots of good root growth. One word of caution: be sure to fertilize **before** the ground freezes.

Late October: Plant tulip bulbs for next spring's garden. Water them thoroughly so they grow a good root system yet this fall. It's also time to protect young thin-barked trees from sunscald and from critters that would gnaw on them. (See Extension folder FO-1411, *Protecting Trees and Shrubs Against Winter Damage*.)

Minnesota Gardening Calendar

For a whole year's worth of valuable horticultural tips and information, pick up a new copy of *Minnesota Gardening, 1996* from your favorite book or gift store. Or buy it at your county extension office. Ask for extension publication MI-5741-S.

The calendar, a joint project of the Minnesota Extension Service and Agricultural Experiment Station, is a great guide to gardening and landscape care in northern climates, and makes an ideal gift at holiday time.

Deborah Brown
Extension Horticulturist

Millipedes

Millipedes have been our number one insect question recently. It is normal during fall for millipedes to enter homes as they try to find sheltered sites to hibernate for winter. Refer to Extension factsheet FS-1023 *Sowbugs, Millipedes and Centipedes in the Home* for a full description of the insects and their habitat.

Most of our callers have been concerned about millipedes in their homes, although a few have been annoyed with large numbers in the yard. This year has turned out to be a good

one for millipedes (i.e. there are lots of them). It would seem that the hot, humid summer was favorable to their development. Even when large numbers are seen, millipedes are still only nuisances. They do not harm people or damage our property. Millipedes do not reproduce indoors and are short-lived inside because it is too dry. They are a temporary problem that will go away on its own when colder weather arrives.

The best control of millipedes is to try to prevent them from entering homes. Refer to factsheet FS-1023 for suggestions and ways to accomplish this. If large numbers are still coming inside, spray either chlorpyrifos (Dursban) or diazinon in a band along the exterior of the foundation and the ground. Control is not suggested for millipedes in yards; they are a temporary nuisance and should go away on their own.

Once millipedes are indoors, there is little to do except to physically remove millipedes as they are seen. It should be dry enough that they will not live long. If they persist, dry out damp areas with a fan or dehumidifier.

Ant Swarms

This information just missed getting into the last issue of MCN but I think it is still worth relating now. The last week of September and into early October, we received many calls about 'insects occurring in large numbers that look just like ants only they have wings'. In most cases the insects were outside, but occasionally they were found indoors. Some people were not sure what they were seeing and some thought they might be termites; others thought they were flies. People were actually finding winged queen and male ants that were part of a mating flight.

Nearly all ants in Minnesota produce a mating swarm but they occur at different times of the year depending on what species is involved. Most of the calls and samples we received were field ants. These ants nest in soil and cause no damage to buildings. Some people were concerned that they were carpenter ants; however, carpenter ants swarm only in spring. One caller did describe an acrobat ant swarm that originated from rotted wood outside, and we received one sample of a thief ant swarm that occurred outside.

These ants are harmless, although they might be annoying if there are a lot of them. The phenomenon is short-lived and they go away on their own. No control is necessary, especially outdoors, for these ants. At best, maybe an aerosol can of insecticide labelled for flying insects if large numbers occur indoors. See Extension factsheet FO-1066, *What to Do about Household Ants*.

Other common insect calls include Indianmeal moths, fleas and fruit flies.

Jeffrey Hahn
Assistant Extension Entomologist

Are They Voles, Moles or Shrews???

If you've noticed shallow underground tunnelling or pressure ridges in your lawn or garden, you could have voles, moles or shrews. Knowing which animal is present is crucial in determining the eradication measures to take.

Voles, also known as meadow mice, construct underground and surface runways in association with many sur-

face holes or entrances. Close inspection in and around the runway reveals small grass clippings and an occasional cluster of dry grasses in a loose ball. Voles also leave winter damage evidence as they make nests between the grass and the snow, sometimes killing the grass in patches. Control voles by trapping them with mouse traps placed adjacent and perpendicular to active runways. Bait traps with a mixture of rolled oats and peanut butter.

Moles also construct surface pressure ridges often producing noticeable mounds of loose soil. Moles rarely travel above the surface of the ground unlike voles and shrews which are often seen running quickly near activity areas. Control moles with the aid of a harpoon trap (found in hardware and farm/garden stores).

Shrew damage is much like that of a vole; however, close inspection of the runways does not reveal grass clippings. Entrance holes are more noticeable and are up to 2" in diameter. Like voles, shrews are controlled with mouse traps placed near active sites. Appropriate baits include peanut butter, chocolate, bacon, ham or raw beef. (See also FS-1139 *Moles and Shrews*.)

Voles Can Be A Winter Problem

Voles can cause winter damage to trees, shrubs and turf. Active year round, night and day, voles consume a variety of plants as well as snails, insects and animal remains. During summer and fall voles store seeds, tubers, bulbs and rhizomes. In winter voles eat bark from trees and shrubs and congregate at easy food sources such as bird seed or pet food found outside the home. Winter presence of voles is obvious in spring as snow melts. As voles build their runway systems they create tunnels and nests right at ground level. This kills grass leaving the runway system visible.

Create a less attractive habitat for voles by keeping your grass cut short and weedy areas to a minimum. Remove easy food sources such as bird seed and pet food. Trap voles using the method above.

Julie Wermerskirchen
Wildlife Technician

Sooty Blotch and Flyspeck Evident on Apples

These two diseases sometimes mar the appearance of apples, pears, plums and other fruits. Sooty blotch appears as cloudy or smudge-like spots on the surface of fruit. Flyspeck is recognized by groups of black dots (fruiting structures of a fungus). Although both diseases usually occur together, they are caused by two different fungi.

Both fungi actually live on the droppings (honeydew) of aphids and other sap-sucking insects. County educators: see the Dial U Brief "Sooty Blotch and Flyspeck on Apple Fruits" for more information regarding the development and control of these diseases.

The damage is superficial and does not affect the fruit itself. Remove the fungi from harvested fruit by gently scrubbing with soap and water.

Rebecca Brown
Plant Pathology Technician

MINNESOTA EXTENSION SERVICE

UNIVERSITY OF MINNESOTA
COLLEGE OF AGRICULTURAL, FOOD,
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Produced by the Educational Development System, Minnesota Extension Service.

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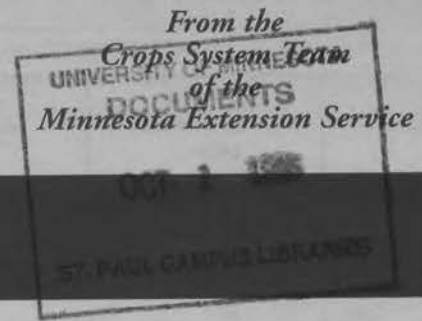
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CROP**NEWS**

More About Sampling Grid Cells for Immobile Nutrients

A grid sampling system is a management practice that is being used more frequently in Minnesota by agricultural consultants and some individual producers as one of their tools in applying precision farming techniques. This system, however, has raised many questions. Up-to-date answers for some of these questions are listed below.

What is the optimum grid cell size for describing immobile soil nutrient status and making fertilizer recommendations?

From an academic prospective, the smaller the grid cell sizes will provide a better documentation of the variation in a field. Research from Wisconsin indicates the use of 450 X 450 foot grid cells (approximately 4.5 acres) is not an improvement from sampling the whole field. They suggest a 200 X 200 foot (1 acre) to 250 X 250 foot (1.5 acre) grid cell size. Current University of Minnesota research at two sites has looked at three grid cell sizes: 60 X 60 foot (0.1 acre), 180 X 180 foot (0.75 acre), and 300 X 300 foot (2 acre). For the actual soil test values, there are some differences in average values with changing grid cell sizes, **Table 1**. At the RA location, when using a standard single mid point sample, the Bray-P test was affected by cell size. The 300 X 300 foot soil test was considerable less than the smaller two grid sizes. At the SB location, Bray-P soil test values decreased with increasing grid cell size. The phosphate fertilizer recommendations for a 150 bu/A corn crop based on the Bray-P soil test are quite different when comparing a 60 X 60 foot grid cell to a

300 X 300 foot grid cell. At both locations the average recommended rate for all cells increased with increased cell size; (35 lb phosphate/A at RA and 7.9 lb phosphate/A at SB). For recommendation purposes, we suggest using the smallest grid cell size that is economically practical. Large cells should be used where this a small amount of variability in a field. If substantial variability is expected, use smaller grid cells. Keep in mind that research projects have not yet defined the "ideal" grid size.

Highlights...September 29, 1995

'Stander' Added To Barley Malting List
 More About Sampling Grid Cells For
 Immobile Nutrients
 CRP Land Into Corn Production: Fertilizer
 Management
 Dial U
 Cleanup Time In The Garden
 Compost Diseased Material With
 Caution
 Choose Trees With Fall Color
 Indianmeal Moths
 Thrips Bites

Immobile Nutrients/Continued

Table 1. The Bray-P soil test values and phosphate fertilizer recommendations for a 150 bu/A corn crop as affected by size of grid cell at two locations in central Minnesota.

RA			SB	
Cell dimensions	P soil test ave. of all cells cells	Phosphate recommendation ave. of all cells	P soil test ave. of all cells cells	Phosphate recommendation ave. of all cells
ft	- ppm -	- lb/A -	- ppm -	- lb/A -
60 X 60	16.4	34.6	27.7	23.3
180X 180	20.1	21.7	26.9	22.1
300 X 300	9.7	56.7	21.0	30.0

How do we soil sample the smaller cell sizes and still remain economically feasible?

A sampling system with different cell sizes may be needed. The reason for using the 450 X 450 ft. soil sample grid cell sizes in a corn-soybean production system is determined to a large extent by the economics of this cropping system. A new soil sampling system would have to be developed which would have no more soil samples to analyze than the 450 X 450 ft. sampling system, but the cell size would change in the field depending on the variability of soil test results and the predicted yield response associated with them. An example would include making large grid cells in areas where the Bray-P soil test is greater than 20 ppm because of no yield response would be expected and small grid cells in areas where the soil test is less than 20 ppm and/or changes in the landscape are quite variable.

What effect does sampling pattern within a grid cell have?

The sampling pattern used within the cell seems to make a substantial difference in the fertilizer recommendations, (Table 2). The use of a midpoint location produced different fertilization recommendations than if multi point (5 to 9 sampling locations in the grid cell) were used. In this study, the multi-point and all points sampling systems produced the same Bray-P test. The all points system required collection from within the 300 X 300 ft. grid on 60 X 60 ft. intervals. If possible, a sampling pattern which would include at least five separate locations in the grid cell, should be used. Again this would increase the number of soil samples but the increased precision in the fertilizer recommendations may be worth it. The midpoint sampling system allows an individual to return to a specific location each time a cell is sampled. With the improvement of global positioning system technology (GPS), the ability to return to the same place using 5 to 9 sampling areas should also be possible.

Table 2. Effect of three types of soil sample patterns on average Bray-P soil tests and phosphate fertilizer recommendations for a 150 bu/A corn crop in a Minnesota field when a 300 X 300 foot grid cell was used.

RA			SB	
Sampling pattern	P soil test ave. of all cells cells	Phosphate recommendation ave. of all cells	P soil test ave. of all cells cells	Phosphate recommendation ave. of all cells
	- ppm -	- lb/A -	- ppm -	- lb/A -
Multi points*	16.7	19.2	30.4	15.0
All points**	16.7	18.3	28.8	15.0
Midpoint***	9.7	56.7	21.0	30.0

* Multi point samples have 5 to 9 soil samples taken in a pattern in the grid cell. Examples of the patterns are /, \, V, X, or Z.

** All points is the mean of all 25 individual soil samples (not a composite sample) in the 300 X 300 grid cell from a 60 X 60 foot grid pattern.

*** Midpoint pattern was one soil sample location in the middle of the 300 X 300 foot grid cell.

Tables 3 and 4 show the Bray-P soil test values for each 300 X 300 ft. grids at location RA and SB. The RA location had three cells while SB was larger with four cells. The comparison indicates that in two of three cells at RA the single midpoint value was less than the all points value which utilized 25 individual soil samples taken in the 300 X 300 ft. cell (Table 3). At the SB site in three of four cells the midpoint value was less than the all point value (Table 4). In both locations, the Bray-P soil test

value derived from a multi point sampling pattern which involved five to nine soil samples was similar to the all point value. In this study the multi point patterns involved separate soil samples which were mathematically averaged and not composited. If a soil sample was composited with equal amounts of soil from each sampling site in a grid and uniformly mixed, a similar soil test value should be obtainable.

Table 3. Bray-P soil test values for location RA for grid cell size 300 ft X 300 ft.

Sampling pattern	Number of soil samples	Cell number West to East		
		1	2	3
		- Bray-P soil test ppm -		
Multi point*	5 to 9	18.8	14.6	16.5
All points**	25	20.1	13.4	16.9
Midpoint***	1	26	2	1

* Multi point samples have 5 to 9 soil samples taken in a pattern in the grid cell. Examples of the patterns are /, \, V, X, or Z

** All points is the mean of all 25 individual soil samples (not a composite sample) in the 300 X 300 grid cell from a 60 X 60 foot grid pattern.

*** Midpoint pattern was one soil sample location in the middle of the 300 X 300 foot grid cell.

Table 4. Bray-P soil test values for location SB for grid cell size 300 ft. X 300 ft.

Sampling pattern	Number of soil samples	Cell number West to East			
		1	2	3	4
		- Bray-P soil test ppm -			
Multi point*	5 to 9	7.5	41.5	45.2	27.2
All points**	25	5.7	41.1	40.9	26.7
Midpoint***	1	0	22	49	13

* Multi point samples have 5 to 9 soil samples taken in a pattern in the grid cell. Examples of the patterns are /, \, V, X, or Z

** All points is the mean of all 25 individual soil samples (not a composite sample) in the 300 X 300 grid cell from a 60 X 60 foot grid pattern.

*** Midpoint pattern was one soil sample location in the middle of the 300 X 300 foot grid cell.

The research in this whole area of grid soil sampling is causing many more questions than it is answering. We do not have a standard "best" economical method to recommend at this time. What we do know is that to optimize

soil sampling information, the person doing the soil sampling will have to use their practical knowledge of the field being sampled.

*John Lamb and George Rehm
Extension Soil Scientists*

'Stander' Added to Barley Mailing List

Stander, developed by the University of Minnesota and released in 1993, is now classed as a malting variety. The American Malting Barley Association (AMBA) completed its malting and brewing evaluations and classified Stander as an acceptable malting variety in August 1995. However, growers, elevators and other grain handlers are strongly encouraged to not mix Stander with other varieties. The AMBA says this due to Stander's high alpha amylase activity. Higher alpha amylase activity, a measure of an enzyme in the malt that breaks down starch to sugars in the brewing process, may cause fermentation to run too rapidly, causing problems for the brewer.

According to AMBA, brewers will need to compliment Stander's unique quality characteristics with other varieties such as Robust and Morex. A biochemical test, gel electrophoresis, can distinguish Stander from Robust. A protein band in Robust that is absent in Stander can be used to tell these varieties apart.

In 1995 Stander was planted on 43 percent of Minnesota's barley acreage, and 28.9 percent of barely acreage across Minnesota and the Dakotas. Stander is well liked by growers because of its good agronomic characteristics. Stander is "non-itchy" like Robust but stands better. It has the same or higher kernel plumpness and also yields more than Robust.

*Ervin A. Oelke
Extension Agronomist*

CRP LAND INTO CORN PRODUCTION: FERTILIZER MANAGEMENT

Fertilizer management decisions are important for those Minnesota farmers who intend to return CRP acres to crop production. It's not practical to make one recommendation that fits all situations. Every farm enterprise is different. Therefore, some general guidelines are provided. Individual growers can work with those that fit their farming operation.

Nitrogen

There's little doubt that nitrogen management is a major consideration for CRP acres that will be planted to corn. Selection of a nitrogen **rate** should be based on yield goal and soil organic matter content. Rates suggested for corn following corn should be used if the CRP acres are to be planted to corn.

The grass and weeds that have been growing for about 10 years are good at utilizing any excess nitrate-nitrogen in the soil system. As a result, there should be very little, if any, nitrate nitrogen above background levels in the root zone. Therefore, nitrogen recommendations for corn following corn are justified for these acres.

Timing of tillage before corn planting will affect N management. Following tillage, there will be some immobilization of nitrate-nitrogen as the bacterial population increases dramatically. This increase in microbial life should stimulate release of nitrate-nitrogen from the decaying organic matter during the latter part of the growing season. This release of nitrate-nitrogen may not be adequate or occur at the proper time to meet the demands of a high yielding corn crop. So, some nitrogen fertilizer (15-20 lb. N/acre) should be applied in a starter if the use of a starter fertilizer is an option. The remainder of the amount needed can be applied either before planting or as a sidedress treatment.

Some nitrate-nitrogen may be released from the soil organic matter after the corn crop reaches maturity. This nitrogen will probably remain in the root zone and be used by the following soybean crop. If corn follows corn, any excess nitrate-nitrogen can be measured by use of the soil nitrate test.

Except for those who attempt to use no-till planting techniques, **placement** will vary with the choice of source. For no-till and ridge-till planting situations, nitrogen fertilizer should be applied below the residue. If not placed below the residue, nitrogen will be immobilized by the increased microbial population.

Phosphate and Potash

Management of these two nutrients for CRP acres is not complicated. A soil test is the obvious beginning. Recommended **rates** are then based on yield goal and the results of the soil test.

When corn is planted with conventional tillage systems, the needed phosphate and/or potash can be either broadcast and incorporated before planting or applied as a starter fertilizer at planting. Recommendations for broadcast application can be cut in half if a starter fertilizer is used. The use of this management practice can result in considerable savings in fertilizer costs.

Banded application of phosphate and/or potash is strongly recommended if no-till planting systems are planned for the first year of production. The accumulation of residue on the soil surface will keep soil temperatures cool. Banded applications have proven to be highly effective in Minnesota when soil temperatures are cooler than normal.

The banded application of **potash** can be very important for no-till planting systems in the first production year. A rate of 40-50 lb. K₂O per acre is suggested. This rate is appropriate even though soil tests for K may be in the medium or high range. The banded phosphate and/or potash can be applied in the fall. The corn can then be planted directly on top of this band. A starter fertilizer band can substitute for the fall-applied band.

Phosphate recommendations for both banded and broadcast applications to match soil test level for phosphorus are listed in **Table 1**. Potash recommendations for both placements to match the soil test levels for potassium are listed in **Table 2**.

Table 1. Phosphate fertilizer recommendations for corn production.

Yield Goal	Phosphorus (P) Soil Test (ppm)*									
	0-5		6-10		11-15		16-20		21+	
	Bray: 0-3	Olsen: Bdcst or Row	Bray: 4-7	Olsen: Bdcst or Row	Bray: 8-11	Olsen: Bdcst or Row	Bray: 12-15	Olsen: Bdcst or Row	Bray: 16+	Olsen: Bdcst or Row
bu./acre	----- P ₂ O ₅ to apply (lb./acre) -----									
70-90	50	25	35	20	20	15	10	10-15	0	10-15
91-110	60	30	40	20	25	20	10	10-15	0	10-15
111-130	75	40	50	25	30	20	10	10-15	0	10-15
131-150	85	45	60	30	35	25	10	10-15	0	10-15
151-170	100	50	70	35	40	30	15	10-15	0	10-15
171-190	110	55	75	40	45	30	15	10-15	0	10-15
191+	120	60	85	45	50	35	15	10-15	0	10-15

* Use one of the following equations if a P₂O₅ recommendation for a specific soil test and a specific yield goal is desired.

$$P_2O_5 \text{ Rec} = [.700 - .035(\text{Bray } P, \text{ ppm})] (\text{Yield Goal})$$

$$= [.700 - .044(\text{Olsen } P, \text{ ppm})] (\text{Yield Goal})$$

** No phosphate fertilizer is recommended if the soil test for P is higher than 25 ppm (Bray) or 20 ppm (Olsen).

Table 2. Potash suggestions for corn production in Minnesota.

Yield Goal	Potassium (K) Soil Test (ppm)*									
	0-40		41-80		81-120		121-160		161+	
	Bray: 0-40	Olsen: Bdcst or Row	Bray: 41-80	Olsen: Bdcst or Row	Bray: 81-120	Olsen: Bdcst or Row	Bray: 121-160	Olsen: Bdcst or Row	Bray: 161+	Olsen: Bdcst or Row
bu./acre	----- K ₂ O to apply (lb./acre) -----									
70-90	80	40	60	30	35	20	15	10-15	0	10-15
91-110	100	50	75	40	45	30	15	10-15	0	10-15
111-130	120	60	90	45	50	30	20	10-15	0	10-15
131-150	145	75	105	55	60	40	20	10-15	0	10-15
151-170	165	85	120	60	70	40	25	10-15	0	10-15
171-190	185	90	135	70	80	50	25	10-15	0	10-15
191+	205	105	160	80	90	55	30	10-15	0	10-15

* Use the following equation if a K₂O recommendation for a specific soil test and a specific yield goal is desired.

$$K_2O \text{ Rec} = [1.166 - .0073(K \text{ Soil Test, ppm})] (\text{Yield Goal})$$

** No potash fertilizer is recommended if the soil test for K is 175 ppm or higher.

Soil tests on CRP land will not change rapidly unless very high rates of phosphate and/or potash are used. Therefore, these nutrients may be needed for the soybeans following corn. With the soybean crop, broadcast applications have been more effective than banded applications.

Other Nutrients

Management of nitrogen, phosphate, and potash is the major consideration for CRP acres. Use of zinc may be beneficial for corn production. Use the results of the

soil test as a guide. For best results, the zinc, if needed, should be applied as a starter fertilizer.

Sulfur fertilization should be a concern if soils are sandy. Use of sulfur fertilizers is not complicated. Either broadcast and incorporate 25 lb. of actual sulfur per acre before planting or use 12 lb. actual sulfur per acre in a starter fertilizer. The application in the starter fertilizer is preferred.

*George Rehm
Extension Soil Scientist*

DIAL U

Dial U is a user-fee telephone diagnostic clinic for calls and samples related to gardening, landscapes, plant diseases, insects and wildlife associated with the home environment. Calls from the public are taken at 1-900-988-0500 weekdays. A flat \$2.99 charge is billed automatically to the phone from which the call is placed.

Clean Up Time in the Garden—When annual vegetables and flowers quit producing or are killed by frost it's time to remove them from the garden. Dead plant materials allowed to remain provide a substrate for pathogens to develop on. Next spring, plant debris—even small pieces—infected with pathogens can get diseases off to an early start. Remove weeds from the garden too, as they can harbor diseases.

- ** Mark fireblighted shoots on apple, pear, mountain ash and cotoneaster with string, ribbon or latex paint. Plan to remove the blighted shoots the end of February or early March.
- ** Mushrooms are common in the fall due to moist conditions. Most are not poisonous but unless you purchase your mushrooms at the grocer they should not be eaten by anyone without a strong mycological background.

Compost Diseased Material with Caution

Composting will kill most disease organisms if the compost heats properly and high temperatures are maintained long enough. Compost piles must have a minimum volume of one cubic yard and be turned every two or three days to provide a mixture likely to heat properly. Keep piles at 65 to 75 percent moisture (fairly moist but not wet). Disease organisms will be killed if temperatures are 130 to 160 degrees for two to three weeks. If temperatures are too low or turning is not frequent enough, pathogens near edges will survive. If you doubt your composting diligence, destroy diseased plant material — don't compost it.

*Cynthia Ash
Assistant Plant Pathologist*

Choose Trees With Fall Color—Every year we hear from people who think they were “cheated” because their young maple didn't develop good fall color. Fall color depends on many factors in addition to which cultivar of tree you plant. Exposure to sunlight, soil type, weather conditions and applied nutrients all play an important role. But in the long run, genetics are crucial. Some individual trees are simply “programmed” for better color than others.

If you want a maple (or other tree or shrub) with gorgeous fall color, visit tree farms or nurseries this autumn when fall color is at its peak in your area. Then you can pick plants specifically with that in mind. Despite the fact there's no guarantee they will duplicate the exact colors in **YOUR** landscape, at least you'll know the trees or shrubs you choose are genetically capable of developing great fall color.

*Deborah Brown
Extension Horticulturist*

Indianmeal moths have been commonly reported lately. People describe finding small (about 1/2 inch long), two toned light gray and reddish brown moths and/or small (up to 1/2 inch long), cream-colored worms (caterpillars). People usually find these insects in the kitchen, although they can be found in any room in the home. Adult moths are most active at night. When you find them resting, their head end is raised higher than their tail end, giving the impression they're doing push-ups.

Only the caterpillar stage feeds. They feed in a wide variety of dried food products, including cereal and flour products, raisins and other dried fruit, nuts, beans, spices and chocolate. They also are found in nonfood items including bird seed, dry pet food, dried plant displays and decorations, and rodent baits. Infested food often has silken webbing in it. ‘Worms’ on the wall or ceiling are Indianmeal moth caterpillars searching for places to pupate (make a cocoon).

If you find Indianmeal moths in your home, the first step is to check for infested food and throw away any you find. If you wish to save lightly affected products, place them in the freezer at 0° for at least four days or put them in shallow pans in an oven at 130° for at least 30 minutes. Clean up any spilled food or crumbs, including vacuuming cracks and crevices. It is not necessary to disinfect counters or other surfaces. Store uninfested food in glass or heavy plastic containers or in the refrigerator.

Insecticides are not suggested. They do not affect insects in food packages. Killing moths found out in the open is only temporary if the food source is not discovered and removed.

It is possible to find an occasional Indianmeal moth as long as three weeks after you have eliminated the food source. This does not automatically mean there is an infestation. As long as there is no food source for them to lay eggs in, they'll die and not cause any further problem. If you do find persistent numbers of adults, there is probably another food source that has not been discovered. See FO-1000, Insect Pests of Stored Foods (this is a newly revised publication).

Thrips bites--Back in early to mid September, we had several samples of tiny insects that were thought to have bitten people. They all turned out to be thrips. While these insects are generally plant feeders (there are some

species that are predaceous on insects), they are known to bite people. As thrips fly about, they will taste test objects, including people, they land on to see if they are suitable plant hosts. This action is annoying but nothing worse. Thrips do not transmit any diseases to people or cause allergic reactions. There is no control as the thrips are everywhere. However, they are just a short-term problem and will go away on their own.

Other insect common calls include carpenter ants, fruit flies and spiders.

*Jeffrey Hahn
Assistant Extension Entomologist*

MINNESOTA EXTENSION SERVICE

UNIVERSITY OF MINNESOTA

COLLEGE OF AGRICULTURAL, FOOD,
AND ENVIRONMENTAL SCIENCES

Produced by the Educational Development System, Minnesota Extension Service.

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CROP**NEWS**

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Corn and European Corn Borer

As everyone now knows, this has clearly been one of our record years for European Corn Borer (ECB) in Minnesota. Yield losses in field corn will continue to accumulate as we approach harvest. Because of continued stalk breakage and/or ear droppage prior to harvest, the sooner the harvest this year the better. Specific questions about expected yield losses for growers who did not treat for 2nd generation corn borer should be directed to Dr. Ken Ostlie (624-9272), Dept. of Entomology.

Interestingly, because of the heat units accumulated in August this year, we just recently documented the beginning of a 3rd generation flight. Light traps at Rosemount were averaging about 1-4 moths per night up through September 11th, and then exploded to about 240/night on Sept. 12 and 13th, indicating a definite 3rd flight; most of these were also male moths (85%), which is also typical of the beginning of a new flight.

As in previous warm years, a 3rd flight in Minnesota is likely to be highly suicidal, in that the offspring will not have time to develop to late instar larvae for overwintering. Thus this late flight will help a LITTLE in reducing the total number of larvae going into diapause (overwintering).

However, given the historic magnitude of the 2nd flight, there will be very high numbers of larvae going to bed for this winter (estimates in Jubilee sweet corn range from 2-5/stalk at Rosemount, as of 9/12/95). The annual fall survey by MDA will give us a better regional picture of what we will have to deal with. Again, mild temperatures with little snowfall, very cold winter temperatures with significant snowfall (>6"), OR mild temperatures and significant snowfall....are all good scenarios for maximum survival of overwintering larvae. When spring arrives, the extent of freezing and thawing, ice-sheeting etc. at the soil surface also plays a role in final survival, pupation and moth emergence. Finally, the level of pathogen infection of larvae this fall will again be important (e.g., with the microsporidium, *Nosema pyrausta*, and the fungi, *Beauveria bassiana*). The

4-6 year cycle of ECB outbreaks in the midwest are partially due to the cyclical patterns of these pathogens that proliferate when ECB is more abundant (density-dependent mortality).

Management Options?? (Cultural/Mechanical, Planting Date, ECB-Resistant Hybrids):

One way to minimize next years' flight is to shred stalks and disk under following harvest (i.e., not a minimum-till approach). However, for this to be effective on one farm, every farm in the area (i.e., several counties) would have to implement the same consistent cultural control...which, for a number of reasons, is unlikely. Therefore, the best options are to plant hybrids with the highest possible natural resistance to ECB (high DIMBOA content, etc.), and if possible plant slightly later than a neighboring farmer. As we saw this year, first-generation moths will be most attractive to the tallest (usually first-planted) corn in the area.

Bill Hutchison
Extension Entomologist

Highlights...September 15, 1995

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Corn?*

*Controlling Perennial Weeds In The Fall
Fall Nitrogen Applications
Plant Disease Clinic Report
Dial U*

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Should I Use Broadcast Phosphate for Corn?

Fall harvest will soon be in full swing and fields will be sampled to determine fertilizer needs for 1996. There are always several questions that need to be answered after the results have returned from the soil testing lab. There are always questions about the use of broadcast applications of phosphate and potash. When are broadcast applications economical? Should I use broadcast applications of phosphate even though soil test values for phosphorus are in the medium to high range? What happens to soil test values if broadcast phosphate is not used?

Decisions about use of broadcast applications should, of course, be based on the results of the soil test. Currently, broadcast phosphate for corn is not recommended if the soil test for phosphorus is higher than 20 ppm (Bray test) or 15 ppm (Olsen test). Broadcast applications are economical if the phosphorus soil test is below 16 ppm (Bray test) or 12 ppm (Olsen test).

Results of recent research trials, conducted in fields of cooperating farmers in Renville County, illustrate how response to broadcast use of phosphate is related to the soil test. These results are summarized in the following table.

Response of corn to use of broadcast phosphate - Renville County.

P ₂ O ₅ Applied lb./acre	R H	Site		
		R Kr	R Ku	R M
		----- bu./acre -----		
0	106	132	146	157
40	123	150	148	159
80	140	154	147	163

Bray P, ppm	6	4	24	16
Olsen P, ppm	6	6	18	12
pH	7.7	7.3	7.4	7.7

Response to phosphate use was substantial when soil test values were in the low range. There was, however, no yield increase from broadcast phosphate use when the phosphorus test was in the very high range (R Ku site). Yield increases were not economical if broadcast phosphate was used at the site where the phosphorus test was just above the medium range (R M site).

Broadcast applications are not the only options open to corn growers. Use of a starter fertilizer at planting can reduce costs because recommended rates are lower. Recommended rates of phosphate fertilizer can be cut in half if a starter fertilizer is used instead of a broadcast application. Use of lower rates in a starter does not reduce corn yield. Results from a trial conducted at the Southwest Experiment Station at Lamberton show the effects of broadcast and starter applications of phosphate (see following table).

Effect of rate and placement of phosphate fertilizer on corn yields. Lamberton, 1992.

P ₂ O ₅ Applied lb./acre	Placement	Yield bu./acre
0		122
40	starter	146
80	broadcast	148

The 2 bu./acre difference between the starter and broadcast treatments was due to natural variation in the field and was not the results of the treatment applied.

Research results from several trials conducted throughout the state show that soil test values for phosphorus do not change very rapidly. So, don't expect large reductions in soil test phosphorus if broadcast applications are not used for one or more years. There's nothing wrong with a reduction in soil test P from the very high to the high range.

George Rehm
Extension Soil Scientist

Controlling Perennial Weeds in the Fall

Fall herbicide applications can provide some of the best perennial weed control of the season. However, fall herbicide applications **DO NOT** always provide acceptable perennial weed control. Many factors influence control. They include:

1. Good active growth of the perennial weed is needed. New shoots should be from underground parts (rhizomes); leaves on old stems (one that flowered this year) are less effectively treated. It is best to have 6 to 8 inches of new regrowth before herbicides are applied. Applying herbicides to perennial weed regrowth after small grain harvest is a good option. If perennial weed regrowth does not occur, it would be best (more economical) to forget a herbicide treatment this fall, and wait to control the perennial weed in the crop next year.
2. Perennial weed plant growth should not be drought stressed or frost damaged. Wait at least 24 hours after temperatures are below 26-28 degrees F to evaluate foliage. Try to apply herbicides when expected high tem-

peratures will exceed 60-65 degree F during the day of application. Research has shown that herbicide effectiveness decreases dramatically after temperatures drop to the mid to low 20's.

3. Select the best herbicide for the situation and crop rotation. Use the highest labeled rate possible. Many herbicides have strict rotation restrictions when applied in the fall. Read the information in the *Cultural and Chemical Weed Control Bulletin* under the perennial weed control section, also read and follow the restrictions on the label.
4. Perennial weed control will be greatest if the field has not been tilled prior to herbicide application. Mowing perennial weeds (in pastures, CRP, roadsides) earlier in the season is a good "set-up" for fall control.
5. Perennial weed control is enhanced by tillage after a herbicide application. Plan to till 2 to 4 weeks after herbicide application. Late fall tillage at least 2 weeks after spraying often adds 10 to 30% control.

6. Plan a crop, tillage and herbicide program for next year that keeps pressure on the perennial weed. Alfalfa and small grains are a better follow-up choice than corn or soybeans.

Herbicide choice, rate and time of application are important factors for treating perennial weeds in the fall. The following is a discussion on some of the options for fall perennial weed control. This is not a complete list, and you should always refer to and follow the herbicide label for rates, application times and recropping restrictions.

Roundup (glyphosate): Roundup can give effective control of many perennial weeds, including Canada thistle, quackgrass and common milkweed, when applied in the fall. Application rates depend on the species, however, in all cases there must be adequate regrowth on the weed, as Roundup has no soil residual.

The rates for fall applications are as follows:

Quackgrass: Apply 1 to 2 qts/A when quackgrass is 6 to 8 inches tall and actively growing. For the 1 qt/A rate apply 0.5 to 1% v/v nonionic surfactant in 3 to 10 gpa of water. For the 2 qt/A rate, apply in 10 to 40 gpa of water. DO NOT till between harvest and fall applications. Allow 3 or more days after application before tillage.

Canada Thistle: Apply 2 to 3 qt/A after harvest allowing at least 4 weeks for initiation of active growth and rosette development. Allow 3 or more days after application before tillage.

For suppression of Canada thistle, apply at 1 qt/A plus 0.5 to 1% v/v of nonionic surfactant in 3 to 10 gpa water. Roundup at 1 pt/A can also be tank mixed with 2,4-D at 0.5 lb/A (1 pt/A of a 4 lb/gal formulation) plus 0.5 to 1% v/v of nonionic surfactant in 3 to 10 gpa of water. Allow 3 or more days after application before tillage.

Milkweed: Apply 3 qt/A of Roundup to actively growing common milkweed plants. Allow 7 or more days after application before tillage. Do Not apply Roundup to common milkweed after harvest unless there is adequate regrowth as the Roundup will not give effective control.

Roundup can also be tank mixed with Banvel (dicamba) or 2,4-D for increased control. When tank mixing Roundup with Banvel or 2,4-D, the Roundup rate can be reduced.

Roundup can also be applied as a "spot-treatment" to patches of perennial weeds. For best control, use a 2% solution (2 qts Roundup per 25 gallons of water).

Recropping Restrictions: Roundup has no soil residual, and therefore no recropping restrictions following fall applications.

Banvel (dicamba): Banvel can give effective control of many perennial broadleaf weeds, including Canada thistle and common milkweed, when applied in the fall. Application rates depend on the species, however, in all cases there must be adequate regrowth on the weed. Banvel has soil residual, therefore follow crop selection is important.

The rates for fall applications are as follows:

Canada Thistle: Banvel can be applied at 0.5 to 2 lb/A (1 to 4 pt/A) after harvest to actively growing Canada thistle. Allow 7 or more days after application before tillage. Banvel can also be tank mixed with 2,4-D or Roundup. This will allow the use of lower Banvel rates (1 to 2 pts/A) in order to decrease carryover potential.

Milkweed: Banvel can be applied at 0.5 to 2 lb/A (1 to 4 pt/A) after harvest to actively growing common milkweed. Allow 7 or more days after application before tillage. Banvel can also be tank mixed with 2,4-D or Roundup. This will allow the use of lower Banvel rates (1 to 2 pts/A) in order to decrease carryover potential.

Recropping Restrictions: Banvel has soil activity and recropping restrictions following fall applications. Corn, sorghum, and wheat may be planted in the spring following fall applications. However, for all crops, injury may occur if the interval between Banvel application and planting is less than 45 days per pint (0.5 lb/A) used, excluding days when the ground is frozen. Research at North Dakota State University indicated that Banvel at 2 pts/A (1 lb/A) applied in late September caused some visible injury to wheat and barley planted the following spring, but the effect on yield was minimal. Banvel at 1 pt/A (0.5 lb/A) applied in late September prevented seed production of sunflower planted the following spring. The approximate ranking of crops from most to least tolerant of Banvel residues is: corn, wheat, barley, oat, potato, buckwheat, soybean, drybeans, sunflower, flax and sugarbeet. **Therefore, if Banvel is applied at 1 pt/A or more in the fall, the "safest" crops to plant the following spring are: corn, wheat, barley, oats, or other grasses. There will be a risk of crop injury to soybeans.**

Curtail and Stinger: Curtail and Stinger both contain the active ingredient, clopyralid, which is very effective for the control of Canada thistle. Curtail is a premix of clopyralid and 2,4-D amine. Curtail and Stinger both have soil residual, therefore follow-crop selection is important.

Curtail: Apply Curtail at 2 to 4 pts/A to actively growing Canada thistle. If Curtail was applied in small grains during the growing season, **DO NOT** apply more than 2 pts/A of Curtail in the fall to the same field. Allow 14 to 20 days following application before tillage. Extreme growing conditions (such as drought or near freezing temperatures) prior to, at, and following application may reduce Canada thistle control.

Stinger: Apply Stinger at 1/4 to 2/3 pts/A to actively growing Canada thistle. Extreme growing conditions (such as drought or near freezing temperatures) prior to, at, and following application may reduce Canada thistle control. Allow 14 to 20 days following application before tillage.

Recropping Restrictions: Curtail and Stinger have soil activity and recropping restrictions following fall applications.

Curtail: Do Not plant wheat, barley, oats, grasses, and corn within 30 days after an application of Curtail. **Do Not** plant sugarbeets in the same growing season following an application of Curtail. **Do not** plant alfalfa, and canola for 12 months following an application of Curtail. **Do Not** plant drybeans, soybeans, and sunflowers for 12 months after an application of Curtail, or 18 months if soil contains less than 2% organic matter and precipitation is less than 15 inches during the 12 months following application. **Therefore, when Curtail is applied in the fall, ONLY wheat, barley, oats, grasses, corn or sugarbeets should be planted the following spring.**

Stinger: Wheat, barley, oats, grasses, field corn, and

Perennial Weeds/Continued

sugarbeets may be planted anytime following application. Do not plant alfalfa, and canola for 12 months following an application of Stinger. Do Not plant drybeans, soybeans, and sunflowers for 12 months after an application of Stinger, or 18 months if soil contains less than 2% organic matter and precipitation is less than 15 inches during the 12 months following application. **Therefore, when Stinger is applied in the fall, ONLY wheat, barley, oats, grasses, corn or sugarbeets should be planted the following spring.**

2,4-D: 2,4-D can be applied in the fall for the suppression of many broadleaf perennial weeds. As mentioned earlier, 2,4-D is most effective when used in combination with other her-

bicides such as, Roundup, Banvel and clopyralid. 2,4-D use rate in the fall is 0.5 to 2 qts/A (4 lb/gal formulation). Ester formulation generally give better control than amine formulations. When 2,4-D is applied in the late fall, at the high use rates, there is a possibility of carryover. Crop injury may occur to broadleaf crops such as soybeans and sunflowers.

Finally, remember that perennial weeds are difficult to control. One herbicide application will not give complete control. A two to three year control program is generally needed to achieve complete control of perennial weeds. However, for some perennial weeds, such as common milkweed, complete eradication from a field may not be possible. Therefore, the goal should be to decrease perennial weed populations to prevent severe crop yield losses and prevent continued spread of the weed throughout the field.

Beverly R. Durgan
Extension Weed Scientist

FALL NITROGEN APPLICATIONS

As harvest approaches, it is natural to think about fall N fertilizer applications. Some precautions regarding these applications are pertinent:

1. **Do not** fall apply N in southeastern MN nor on coarse-textured soils anywhere in the state.
2. Anhydrous ammonia is the product of choice; however, urea is an option in southwestern, west-central, and north-western MN.
3. Refrain from applying N until the soil temperatures are below 50 degrees F, which normally occur in late October for southern MN and mid October for central MN.

4. N-Serve is recommended only on poorly-drained soils with relatively high surface soil moisture levels in south-central MN.

5. Use the soil nitrate test in western MN to refine this fall's N application rate.

This is an abbreviated guide. Please refer to the Minnesota Extension Service's *Best Management Practices for Nitrogen Use in (SE/SC/SW/WC/NW/C/EC) Minnesota* for more details.

Mike Schmitt
Extension Soil Scientist

PLANT DISEASE CLINIC REPORT

Samples submitted to the clinic in August included:
soybean—soybean cyst nematode (SCN), *Pythium* sp and *Phytophthora* sp root rot
pinto bean—*Pseudocercospora* sp (white leaf spot)
corn—*Kabatiella* sp (Eyespot) and *Phyllosticta* sp leaf spot
wild rice—*Bipolaris* sp leaf spot
hay, silage, corn—storage molds
sunflower—*Rhizopus* sp head rot, *Phoma* sp stem lesion
clover—*Stemphylium* sp leaf spot
turf—*Pythium* sp and *Rhizoctonia* sp root rot, *Colletotrichum* sp (anthracnose), *Drechslera* sp leaf spot
amur chokecherry—*Verticillium* wilt
elm—DED
oak—oak wilt
juniper—*Phomopsis* sp twig blight
maple—*Verticillium* wilt

hydrangea—*Pythium* sp root rot
rose—*Cylindrocladium* sp root and stem rot, *Pratylenchus* sp (lesion nematode)
phlox—*Phytophthora* sp root rot
creeping phlox—*Rhizoctonia* sp stem rot
peony—*Phyllosticta* sp leaf spot, *Rhizoctonia* sp root and stem rot
pansy—*Pythium* sp root rot
N.G. impatiens—Impatiens necrotic spot virus
geranium—*Xanthomonas* sp (bacterial wilt)
cucumber—bacterial leaf spot
rhubarb—*Colletotrichum* sp
eggplant—*Verticillium dahliae*
raspberry—*Coniothyrium* sp (cane blight)
apple—*Venturia inaequalis* (scab)
strawberry—*Xanthomonas* sp (angular leaf spot)

Sandee Gould
Plant Disease Clinic

Dial U

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Tomato Blights

Tomato blight caused by the fungus *Septoria lycopersici* has severely damaged tomato plants in many home gardens. (Reports suggest that some gardeners were tired of canning

anyway.) Initially the lower leaves develop circular spots up to 1/8 inch in diameter with a light center and dark margin. Tiny black speck-like fruiting structures are formed by the

fungus in the center of the lesion and help to distinguish this blight from early blight, another common tomato disease. Petioles, stems and the flower calyx also become infected as the disease moves up the plant.

The fungus survives in or on seed, in and on overwintered debris from diseased plants, in infected perennial weeds and in association with infested greenhouse frames and sashes and transplant production containers. Avoid disease problems next year by cleaning the garden out well this fall, taking care to remove all tomato debris and weeds. **Do not** plant tomatoes in the same spot next year. Avoid working in the garden when the plants are wet, stake plants to increase air circulation and allow plenty of space between plants. Monitor the plants for evidence of disease, remove infected leaves as soon as noticed and begin application of a fungicide, to protect the remaining leaves.

Cynthia Ash
Assistant Plant Pathologist

Lawncare

Dial U is constantly trying to convince people that autumn is truly the best time to put effort into their lawns. It's like money in the bank; it will pay dividends next spring and summer.

Unless you live in the southernmost parts of the state, it's probably too late now to do any seeding, but it's not too late to fertilize and core aerate. And if broad-leaf weeds are a problem, you can still zap them with herbicides — provided you haven't seeded in those areas.

Now's the time to check those areas of the lawn you may have sprayed with a borax and water solution. Did it do a reasonably good job on the creeping charlie? Remember, you can't repeat in the same location. Boron builds up in the soil and will soon prove toxic to grass.

Fall Planting

Many nurseries and garden centers have reduced their prices on trees and shrubs, along with any flowering perennials they might still have on hand. They'd just as soon not carry them over till next year, but there's no reason you can't plant them in your landscape right now, with good results.

Perennials and evergreens should be planted as soon as possible; deciduous trees and shrubs are not quite as particular. Regardless of what you're planting, be sure to mulch them before weather turns terribly cold. Mulch will allow you to continue watering the new plants a bit longer, as it keeps soil from freezing as early. (Don't water much if we have a rainy autumn.)

Deborah Brown
Extension Horticulturist

Yellowjackets and Food

These black and yellow insects continue to be conspicuous pests. In addition to finding yellowjackets and their nests in and around homes, these insects are also terrible pests around any outdoor activity that has food and drinks. Because their nests are in a state of decline and queens stop laying eggs, workers are less interested in protein (they normally capture live insects during most of the year to feed their young). Instead they feed more commonly on carbohydrates (i.e. sweets). You can expect anytime that food is served outside, yellowjackets will be uninvited guests.

There are several steps you can take to reduce the risk of yellowjackets joining your gathering unannounced, but re-

alistically you cannot completely avoid them. First, do not bring food out until you are ready to cook it or eat it. When you are done eating, promptly put food away in tightly sealed containers. Garbage should be thrown away as soon as possible, preferably in receptacles with tightly fitting lids.

Be careful when drinking from cans, cups or glasses. If you take a drink while a yellowjacket is taking its own sip, you are likely to get a nasty surprise. Keep your hand over the top while you're not drinking (or better yet, use cups with lids) and check the top to be sure nothing has flown in before taking a drink.

If a yellowjacket approaches you, avoid swatting it. If you have no food, remain still and the insect should fly away on its own. If you are eating and/or the yellowjacket is persistent, gently brush it aside and encourage it to look elsewhere (with a little luck).

If despite your best efforts a sting occurs, the pain should be short-lived. You can relieve the discomfort with an ice pack applied to the wound and pain relievers. The use of calamine products (e.g. Caladryl) may be helpful. Uncommonly, a few people may develop an allergic reaction which could be life threatening. If someone develops a severe reaction after a sting, see a physician immediately.

Late Season Caterpillars

These insects continue to be quite common. The most frequent questions have been about fall webworms. This has been a very good year for this caterpillar. They are easy to identify as they web the ends of branches together (or if small, entire trees or shrubs). They feed on many different trees and shrubs including black locust, cherry, crab apple, birch and oak. Sometimes defoliation can be severe. In most cases, healthy mature landscape plants are not seriously injured.

That's fortunate as fall webworms are difficult to control. Once they start forming webs, insecticides do not penetrate through the silken mat. You can try to pull the webbing and the caterpillars off but this is usually not easy either. Pruning off branches with webbing will eliminate the insects but is not good for the tree or shrub in the long run, especially if there is repeated pruning.

Other caterpillars we have had reports about include whitemarked tussock moths, redhumped caterpillars, yellownecked caterpillars, unicorn caterpillars, orangestriped oakworms, cecropia caterpillars and sphinx caterpillars (hornworms). Any feeding occurring in September is not important to the health of trees and shrubs, and the insects can be ignored.

Other common insect questions include carpenter ants, foreign grain beetles, crickets, fleas, head lice.

Jeffrey Hahn
Assistant Extension Entomologist

Woodpeckers on Siding and Trees

Woodpeckers make holes in trees and on siding as they search for food, create a nesting cavity, or attempt to attract a mate. Discourage woodpeckers from these areas with visual repellents. These could include hanging pie pans, hanging aluminum foil streamers 2 inches wide by 3 feet long or Bird Scare Reflecting Tape. Place any of these directly into the area where the damage is occurring.

Julie Wermerskirchen
Wildlife Technician

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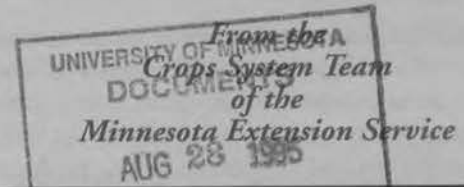
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CROP

NEWS



Is Soil Sampling Pattern Important with Grids?

One aspect of precision farming is variable rate fertilizer application. With phosphorus and potassium, the practice of grid soil sampling has been used to create the soil condition map to run the high technology fertilizer spreaders. Several questions come to mind when using grid sampling.

1. How big should the grids be?
2. What sampling pattern should be used with each grid cell?
3. What effect does the time of year have on P and K soil test results?

To access these questions a study has been conducted in South Central Minnesota the last two years by U of Minnesota soil scientists John Lamb, George Rehm, Gary Malzer, and Pierre Robert. The funding has been from several sources: Minnesota Corn Growers, Farmland Industries, Ag Vise Labs, Minnesota Valley Testing Labs, and A and L Soil testing Labs at Atlantic, Iowa.

The research data suggests that the smaller the grid the better characterization of an area occurs. One factor which is important in grid size determination is **ECONOMICS**. The economics of grid size depends on value of the crops, size of yield response to P and K, and sampling frequency (number of years between samples). The smaller the grid the greater the number of soil samples which increases sampling and analysis costs. These economic conditions are what is driving the 350 to 450 foot grid sizes currently used. A modified approach needs to be used where a field would be evaluated and grid size would depend on the variability in each part of the field. There would be areas with small grids, such as 60 foot, where there is a large amount of variability, and grids of 500 foot or greater where the variability is small.

A study is under way to determine the sampling pattern that should be used for the grid cells. In this study, eleven different patterns were compared at two different grid sizes. The collection of the sample from one point in the center of

the cell gave consistently different recommendations compared to the other sampling patterns which involved 3 to 9 points in the grid in various other patterns. This means that just sampling the intersection point will not be adequate to describe the grid for P or K recommendations. We know that using the intersections is easier to relocate in following years, but with the improvements in locating systems (GPS) this problem should be reduced in the future.

With grid sampling, the volume of soil samples has increased. This means the time to do field sampling and laboratory analyses has increased. This has caused the need to increase the window during the season to sample immobile nutrients. Will this be during the growing season or winter? The answer is not completely known. At this time we think that taking samples at different times during the growing season may not be a problem particularly if a field is sampled at the same time of the season each time. We do not know what effect winter sampling has on soil test results but believe that sample handling could have an effect.

There are still a lot of questions which need answers with variable rate technology. At this time the black box technology has moved ahead of the agronomics and economics.

John Lamb
Extension Soil Scientist

Highlights...August 25, 1995

Is Soil Sampling Pattern Important with Grids?
Sweet Corn
European Corn Borer & Corn Earworm
Rotenone
Dial U

Sweet Corn

European Corn Borer & Corn Earworm

Though nightly trap catches of moths continue to remain high (75 - 400/night) throughout most of southern Minnesota, these counts are still much less than the previous 2 weeks. We should now be past the peak (50%) moth emergence for the 2nd generation flight. ECB egg-lay continues to be heaviest in row-tassel or first-silking corn, ranging from 45-80% of the plants infested with 1 or more egg masses/plant (often 2-3/plant; George Klacan); most (ca. 75%) of these eggs this past week were in the 'black-head' stage, also indicating a slight decline in freshly-laid egg masses.

Despite the high ECB pressure this year, both the mid- and high-rates of Pounce 3.2E and Warrior 1E, on a 5 to 7-day schedule seem to be working well in processing sweet corn. Our annual late-season ECB+CEW insecticide trial is still underway at Waseca, but our previous studies have also shown good activity by these materials under heavy ECB and CEW pressure. Recently harvested untreated check plots at Waseca and Rosemount have been averaging 80-100% of the ears infested, often with 2 to 5 late-instar larvae per ear. (FYI: also note that both pyrethroids performed well against fall armyworm, a sporadic migrant pest in the midwest, in plots that were artificially infested with armyworm egg masses and evaluated Aug. 23, 1995 at Rosemount).

CEW trap catches have remained at relatively low levels of 5-12/night at Rosemount (Dave Bartels), Hastings and Apple Valley (Gary Collins) and at Le Sueur (Dave Bach). Given the combined ECB + CEW pressure, a 6-7 day spray schedule should still be optimal for processing sweet corn (with Pounce, Ambush or Warrior). Fresh-market growers may go to a 4-5 day schedule, but for either crop, sprays should be discontinued within 7 days of harvest. We still could get a major influx ANY DAY NOW of CEW moths.... but I am not sure at this point how much

corn will be left with fresh silks that will be attractive for egg-lay. With the heat the past 2 weeks, most planting dates are all starting to bunch together, which should make for an interesting harvest and processing schedule. Remember though that CEW lay their eggs singly and directly on the silks. Once neonate larvae hatch (about 60 degree-days; = 3 days at 20 degree-days/day), they can probably burrow into the tip of the ear within 2 hours. Therefore, it is critical to have insecticidal residual activity on the corn silk/plant tissue when larvae are hatching to obtain effective control.

Finally, most of the insecticides labelled for sweet corn will also provide some ovicidal activity on CEW and ECB. For ECB, egg mortality can range from 15-40% for the pyrethroids, with no single pyrethroid having an advantage over another. I can provide more details on this for those who are interested; or, you may have access to a recently published paper by one of my students: J.H. Rinkleff et al. 1995. *J. Economic Entomology*, vol. 88: pp. 246-253 (I can provide reprints). The bottom line is that sprays should be applied while eggs are being laid, to provide ovicidal activity plus residual coverage for hatching larvae.

In contrast to the pyrethroids, methomyl (Lannate) provides very high ovicidal control (e.g., 90%), but because of minimal residual activity in the field (< 2 days), very poor control of hatching larvae). Thus it is often tank-mixed with other materials, but should not be used alone. Again, PennCap-M provides good ovicidal and larval activity on ECB, but IS NOT EFFECTIVE ON CEW. Asana XL (at the presently max. labelled rate of 0.05 lb AI/ac) provides good control of CEW, but POOR CONTROL OF ECB. Thus, neither of these materials should be used when both pests are present.

Bill Hutchison
Extension Entomologist

Rotenone

The Rotenone Task Force has indicated that all agriculture uses of rotenone will be dropped from labels. Only use for fish control in reservoirs, lakes and streams, and flea, tick, and louse control on dogs and cats will be retained. This

compound was one of the few that were certified to be used in organic food production.

Dave Noetzel
Extension Entomologist

Dial U

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Ascochyta Stem Rot

Clematis vines which suddenly wilt for no apparent reason may be infected with Ascochyta stem rot. This fungus attacks the stem near the soil line, girdling it and causing the upper parts to die. Infection of the current years growth

occurs via spores formed on last years stems. Like most fungi, Ascochyta stem rot is favored by damp or wet conditions.

Stem rot kills only the above ground portion of the plant; infected clematis should send up new shoots next year. Cut back all dead vines to ground level this fall (or as they die) to remove as much of the fungus as possible. Next spring, dust with sulfur beginning just before the new shoots emerge and repeat after every rain or irrigation.

*Rebecca Brown
Sr. Lab Tech, Plant Pathology*

Pollination Problems in the Veggie Garden

Each year we get callers who wonder why their melons, squash or cucumber crops failed. For several years running, cool temperatures might have played a role, certainly in limiting maturation. Obviously, that hasn't been a problem this year. Yet we've heard from people whose zucchinis started to grow, then just shrivelled up and dropped off, who had misshapen cukes, and who never got a single pumpkin or watermelon started. These are all signs of pollination problems. (Cukes could also be suffering from large fluctuations in moisture going to the developing fruit.)

These related plants in the cucurbit family all produce both male and female flowers. It's easy to tell them apart because the female has an enlargement shaped like the fruit that will eventually develop, right behind the flower. Only the females will result in fruit, but pollen from the male flowers must make its way to the receptive parts of the female flowers first. And the flowers only stay open for one day.

Pollination problems can arise in a number of circumstances. Early in the season, or sometimes when cucurbit plants are under stress, they produce only male flowers. Excessive use of insecticides can limit the number of bees and other pollinating insects that visit the flowers. Wet, cloudy weather will limit insect activity, also. Overcrowding can contribute to problems of shady conditions, as does planting vine crops in inadequate sunlight.

If all else fails, try a little hand pollinating, using a child's soft paintbrush or a cotton swab to transfer pollen. It's too late to get pumpkins, winter squash or melons that will mature before frost, but you can certainly have some success with cukes, zukes, patty pans or other summer squash that are best picked small, anyway.

*Deborah Brown
Extension Horticulturist*

Yellowjacket problems

Yellowjacket problems have increased recently with the end of summer approaching. It is not necessary to treat nests that are away from human traffic in out of the way of places, such as in big trees. The wasps only survive until the end of fall.

If you find a wasp nest close to areas people frequent, someone should attempt control. An aerosol insecticide la-

belled for wasps and hornets (e.g. containing resmethrin or Baygon) is effective. Spray directly into the nest opening in the evening (when wasps are less active).

Sometimes nests are hidden and you only see the entrance. In the case of nests in the ground, try mixing a soap and water solution and pouring it down the nest. You can also try an insecticide labelled for use in lawns, such as carbaryl (Sevin) or diazinon.

If the nest is hidden behind a wall void or somewhere similar, you can try an aerosol insecticide into the opening where the wasps go in and out, although that may not work well. Another option is to try a dust (labelled for indoor use), e.g. chlorpyrifos or bendiocarb. Drill small holes and puff in small amounts of the dust (e.g. in an old plastic ketchup bottle). Always use great care when attempting wasp control.

Hiring a reputable pest control service is also an option. See FO-3732, *Are They Wasps or Bees?*

Tomato Hornworms

Tomato hornworms have been reported lately in home gardens. They have been found feeding on tomato leaves but also are known to feed on eggplant, pepper, potato, groundcherry, and other plants. These large caterpillars grow up to three or four inches long. They are green with yellow spots and white stripes that form a series of V's. Tomato hornworms also have a horn on their tail end. These caterpillars grow up to be sphinx moths which can have a wingspan up to four or five inches.

People normally do not see more than a few of these insects at a time and the easiest control is to handpick and destroy the insects. Small, white, oval objects on the caterpillars are cocoons from parasitic wasps that helps control tomato hornworms. Allow them to hatch so the new adults can parasitize other caterpillars.

Katydids

Katydids have been a common question the last few weeks. Katydids are relatives of grasshoppers and crickets and like to live in the tops of trees. The males 'sing' at night by rubbing their wings together to create a rapid pulsed sound to attract a mate. Some people are curious as to what kind of nocturnal creature is creating that sound while others are annoyed. Katydids can sing most of the night and several nights in a row. Some people report katydids in their neighborhood have been singing for several weeks in a row. Unfortunately there is no practical control (one caller was curious about a little dynamite); you can only wait until they finish which should be by the end of summer.

*Jeffrey Hahn
Assistant Extension Entomologist*

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CROP

NEWS

UNIVERSITY OF MINNESOTA
From the
Crop Systems Team
of the
Minnesota Extension Service
AUG 19 1995

Ridge-Till Systems and Precision Farming

In recent years, there have been several questions about the ridge-till planting system. Is this a planting system that I should use in the future? Can I make the ridge-till planting system work? How does ridge-till fit in the concept of precision farming? These are some of the most common questions on the minds of Minnesota farmers.

There are several advantages to using this planting system. They are:

- ✓ **Friendly to the Environment** — There's no doubt that the use of this system reduces the amount of soil lost to water and wind erosion. This is certainly a planting system that can be adopted and used by farmers who are concerned about soil erosion and soil stewardship.
- ✓ **Economical** — Several summaries prepared by farm management studies have shown that production costs associated with the ridge-till planting system are lower than the costs associated with fall-plow or fall-chisel planting systems. Lower costs arise from the use of banded fertilizer and herbicide, reductions in the amount of diesel fuel needed, and savings in money spent for machinery.
- ✓ **Moisture Conservation** — Moisture loss from the soil system is reduced when crop residue is left on the soil surface. In dry years, a conservation of soil moisture can translate into more bushels of corn per acre.
- ✓ **A Good Match With Precision Farming** — Precision farming is more than the use of variable rate fertilizer application. The use of banded fertilizers and banded herbicides are an important key to the more precise use of inputs. These management practices fit very well with the overall concept of precision farming.

In past years, adoption of the ridge-till planting system was slowed to some extent by limitations of existing equipment, lack of herbicides that work well in high residue situations, and lack of knowledge about adopted fertilizer management practices. Many of these problems have been solved. Several research projects in the Northern Corn Belt have shown that yields are equal when ridge-till is compared to the more conventional tillage systems. If yields are equal and costs are reduced, this should translate to more profit. It is difficult to argue against using a planting system that has the potential for making more money.

George Rehm
Extension Soil Scientist

Highlights...August 18, 1995

Ridge-Till Systems And Precision Farming
Weather Conditions Right For Spread Of White Mold In Dry Beans
Estimate Stored Bushels
Corn Earworm Alert
Dial U
Club Root
August Lawn Care
Home-Invading Weevils

Weather Conditions Right for Spread of White Mold in Dry Beans

Weather conditions during the last 2-3 weeks have been very conducive to the spread of white mold in dry beans. Reports are indicating that pressure is even great in fields that were sprayed using chemicals applied at the recommended rates and time. Topsin M and Benlate are excellent white mold control chemicals when used at the right time. Total control is rare and during periods of high disease pressure the disease will still be obvious in treated

fields. Benefits of spraying are only recognized at harvest. Applications of the above chemicals are not recommended during pod fill. Harvest beans as soon as possible after maturity to prevent pod deterioration and seed discoloration. In the meantime hope for some hot dry weather which will dry out the canopy.

*Richard A. Meronuck
Extension Plant Pathologist*

Estimate Storage Bushels

Whether grain is stored in square or rectangular buildings, round bins, or triangular or conical piles, you can easily estimate the number of bushels.

All you need to know are the following formulas:

SQUARE AND RECTANGULAR BINS

Measure the length (L), width (W) and average height (H) in feet of the grain. You may wish to level a section of the pile to obtain a more accurate measurement.

The formula is: $L \times W \times H = \text{Volume}$

Example: $25 \times 12 \times 8 = 2,400$ cubic feet

ROUND BINS

Measure the diameter (D) and height of the bin.

The formula is $D \times D \times H \times 0.785 = \text{Volume}$

Example: $24 \times 24 \times 18 \times 0.785 = 8,138.88$ cubic feet

TRIANGULAR PILE

Measure the length, width and height of the pile.

The formula is $L \times W \times H \times 0.5 = \text{Volume}$

Example: $25 \times 25 \times 7 \times 0.5 = 2,187.50$ cubic feet

CONICAL PILE

Measure the total height and diameter of the pile.

The formula is $D \times D \times H \times 0.262 = \text{Volume}$

Example: $20 \times 20 \times 8 \times 0.262 = 838.40$ cubic feet

CALCULATING BUSHELS

One cubic foot holds approximately 0.7786 bu. of grain — any grain. Simply multiply the volume of grain in cubic feet by 0.7786.

For rectangular bins in the example above, $2,400$ cubic feet $\times 0.7786 = 1,869$ bu.

In round bins, $8,139$ cubic feet $\times 0.7886 = 6,337$ bu.

In triangular pile, $2,187$ cubic feet $\times 0.7886 = 1,702$ bu.

In conical pile, 838 cubic feet $\times 0.7886 = 652$ bu.

These formulas will not be accurate to a single bushel, but they will give you a good estimate of the number of bushels stored in a shed, bin or pile without having to count each truckload.

*Harold Stanislawski
Extension Educator, Otter Tail County*

Sweet Corn

Corn Earworm Alert!! Corn earworm (CEW) moths have arrived in southern Minnesota. Traps in Apple Valley, Hastings, and Rosemount are capturing from 4-12 moths/night. The peak flight may still not occur until August 20. With CEW and European corn borer present in sweet corn, only the following materials should be used:

Ambush 2E, Pounce 3.2E, or Warrior 1E. See previous newsletter articles for proper rates. At current CEW levels, spray intervals should be 5-7 days at late tassel, up to 7 days before harvest.

*Bill Hutchison
Extension Entomologist*

Dial U

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Club Root

This fungal disease of cabbage and related plants attacks below the ground but, of course, symptoms above ground alert us to the problem. Look for yellow leaves, stunting, wilting and death. Carefully dig up the affected plant to observe the root system. Infected roots are enlarged, distorted and resemble clubs, hence the name. The fungus is present in contaminated soils and is spread by drainage water, infested soil and infected plants. Acidic soils and cool wet weather favor pathogen development. The disease is not seed borne.

Plant in disease free soil or where no disease has been found. If soils are acidic, the incorporation of lime to raise the pH to 7.2 will reduce the amount of club root. Use a long rotation between cabbage and related crops.

Cynthia Ash
Assistant Plant Pathologist

August Lawn Care

Heavy rains in much of the state have left lawns quite green and lush for this time of year. If grass in your area is not moisture-stressed, it's a good idea to put down your first fall application of fertilizer sometime between mid-August and early September. (The second application goes on mid to late October.)

Nutrients added in autumn increase good root growth whereas spring applications usually result in more topgrowth, often at the expense of root reserves. Though many people choose special "winterizing" fertilizer for the October application, standard high nitrogen lawn food will also work just fine.

As long as you're **not planning to overseed** your lawn, you may be able to go after broad-leafed weeds in August; it just depends on the weather. Once daytime temps are **consistently** in the 70's or perhaps the very low 80's you can spot spray individual weeds or weedy portions of the lawn. Use a hand held sprayer rather than one that attaches to the end of your hose. You'll have much better control over where the spray lands. Of course, you need to apply herbicide on a day when winds are calm and no rain is predicted for a couple days. Be sure, too, to follow label directions exactly when mixing herbicide concentrate. It's a mistake to make it stronger. You may "burn" the tops off the weeds, but never get good movement of the weed killer into the roots.

If you're trying to get rid of poison ivy, you must use brush killer or poison ivy killer **before** the foliage starts

to develop fall color. Once it colors, weed-killers applied to the leaves won't be pulled into the roots effectively.

Deborah Brown
Extension Horticulturist

Home-invading Weevils

We have been receiving a steady number of calls about strawberry root weevils and weevils known as *Polydrusus* sp. Both weevils are about 1/4 inch long, oval-shaped with a short snout. These weevils are typically found starting in late June and are most common in July and August. They have one generation a year.

Strawberry root weevils are black or brown. People often describe them as looking like 'wood ticks'. Strawberry root weevil larvae are known to feed on the roots of strawberries, evergreens, especially arborvitae, and other ornamentals. After emerging as adults, these weevils feed on trees and can girdle stems.

Polydrusus weevils are pale green. Their larvae are known to feed on the roots of various hardwoods, including willow, poplar, birch, apple, pear, and plum. Adults can feed on developing buds, foliage and succulent shoots. *Polydrusus* weevils have been particularly common in the northeast area of the state.

People are most familiar with these insects as nuisances inside buildings. You can find them in any room indoors; they are usually found on walls and ceilings. Strawberry root weevils are common around sinks, bathtubs, basins, and other sources of moisture. These weevils are harmless inside; they do not damage wood, clothing, food products, or other items. These weevils do not breed indoors or live more than a few days inside.

You can try to prevent these weevils from entering homes by caulking or sealing conspicuous cracks or spaces around the outside that may allow insects entry into homes. An insecticide treatment spraying chlorpyrifos or diazinon may also help if you encounter large numbers of weevils (or you can hire a pest control service to do this).

The easiest control for weevils found inside is to remove them by hand or vacuum. The use of insecticides inside is not suggested due to the harmless and short-lived nature of these weevils. People should notice fewer weevils by September. Eventually they will disappear on their own.

Jeffrey Hahn
Assistant Extension Entomologist

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CROP**NEWS**

From the
Crops System Team
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Fall Perennial Weed Control

Fall herbicide applications can provide some of the best perennial weed control of the season. However, fall herbicide applications do not always provide acceptable perennial weed control. Many factors can influence perennial weed control.

Beverly Durgan, Extension Agronomist-Weed Science, has put together some weed control tips that should be considered in planning fall perennial weed control.

1. Good active growth of the perennial weed is needed. New shoots that have formed from underground rhizome parts will have more active growth than old plant parts that have flowered. Perennial weeds should have between 6-8 inches of new growth before herbicides are applied. After small grain harvest is a good time to apply herbicides. If no regrowth occurs with perennial weeds after harvest, then wait until next spring for perennial weed control.
2. Herbicides should not be applied to perennial weeds that are stressed from drought or frost damage. When frost temperatures below 26-28°F occur, wait at least 24 hours to evaluate foliage. Herbicides cannot translocate if the weed is dead. Apply herbicides when temperatures are expected to exceed 60-65°F during the day to ensure active translocation.
3. Select the correct herbicide that fits the crop rotation sequence. Use the highest rate labeled. Some herbicides have crop rotation restrictions and one needs to pay close attention to the label.
4. Perennial weed control will be the greatest if the field has not been tilled prior to the herbicide application. Mowing perennial weeds in pastures, roadsides, and CRP earlier in the season will enhance the weeds to

produce new shoots. This will allow a good setup for a chemical treatment later in the fall.

5. Perennial weed control is enhanced by tillage after a herbicide application. However, one must plan to allow 2 to 4 weeks time to pass after herbicide application to get the full impact of the chemical. Waiting this time can increase control by 10 to 30 percent.
6. Plan a crop that will keep pressure on perennial weeds for the next year for the next year. Some examples would be small grains, alfalfa, and buckwheat.

Kevin Cavannaugh
IPM Specialist—West Central Experiment Station

Highlights...August 11, 1995

- Fall Perennial Weed Control
- Early Sampling For Nitrate-Nitrogen
- Drying And Storing 1995 Small Grains
- Corn Diseases
- Cabbage And Cole Crops
- Cabbage Looper Alert #2
- Sweet Corn
- European Corn Borer Alert #2
- Corn Rootworm Emergence Underway
- Dial U
- Black Rot
- Blow Flies
- Dial U Identifications

Early Sampling for Nitrate-Nitrogen

The use of the soil nitrate test is widely recognized as a good management tool for more accurate nitrogen fertilizer recommendations in Western Minnesota. It's easy to collect these samples from small grain fields that have just been harvested. There is, however, some question about when this sampling should begin.

Although the small grain is harvested, the supply of nitrate-nitrogen ($\text{NO}_3\text{-N}$) in the soil does not remain stable. Factors such as tillage and regrowth of weeds and volunteer grain can cause changes in the amount of $\text{NO}_3\text{-N}$ measured at any given time.

Tillage operations following harvest can increase the amount of $\text{NO}_3\text{-N}$ measured. The increase will depend, to some extent, on soil temperature and the organic matter content of the soil. Volunteer small grain and weed growth will absorb $\text{NO}_3\text{-N}$ and measured amounts can be reduced.

Considering only the two factors of tillage and regrowth, there was a need to monitor changes in $\text{NO}_3\text{-N}$ following small grain harvest. To do this, soil samples were collected at frequent intervals from small grain stubble fields at the Southwest Experiment Station and the West-Central Experiment Station. These samples were analyzed for $\text{NO}_3\text{-N}$.

The results from the Lamberton location are summarized in **Table 1**. The stubble was either chiseled or left without tillage following harvest. For each tillage situation, the volunteer grain and weeds were either allowed to grow or killed periodically with Roundup.

The results from the West-Central Experiment Station are summarized in **Table 2**. Weeds and volunteer grain were control in both tillage systems at this site.

It's not possible to make firm suggestions and recommendations based on the results from two sites in only one year. The data does provide evidence for some important considerations. These are:

- ✓ There is a substantial amount of variation in soil $\text{NO}_3\text{-N}$ at any given site over time.
- ✓ The use of the fall chisel tillage operation usually increases the amount of $\text{NO}_3\text{-N}$ measured to a depth of 2 feet.
- ✓ Growth of weeds and/or volunteer small grain can have a substantial impact on measurement of $\text{NO}_3\text{-N}$. For example, $\text{NO}_3\text{-N}$ at the Lamberton site seemed to increase slightly or remain the same until mid-September. Then, with no attempt to control weeds and/or volunteer grain, there was a reduction in the amount of $\text{NO}_3\text{-N}$ measured. This reduction seemed to occur in both tillage systems until mid-November.

This project is being continued in 1995. There may be situations such as planting of winter wheat where early sampling is necessary. There are also many acres to sample and time available for sampling is limited. Yet, we could not get an accurate picture of residual $\text{NO}_3\text{-N}$ if the soil sample is collected too early.

It would be nice to provide some adjustment in $\text{NO}_3\text{-N}$ for the data sampled. For Minnesota, we do not, as yet, have the data necessary for this adjustment. It's still wise, if possible, to delay sampling for $\text{NO}_3\text{-N}$ until soil temperatures cool and the growth of weeds and volunteer grains slows down.

George Rehm
Extension Soil Scientist

Table 1. Soil $\text{NO}_3\text{-N}$ (0-2 ft) following small grain harvest at Lamberton as affected by tillage and Roundup use.

Tillage Used	Herbicide Used	Sampling Date (1994)								
		8/1	8/15	9/1	9/15	9/30	10/15	11/1	11/17	
		----- lb. $\text{NO}_3\text{-N}$ /acre -----								
Chisel	no	30	42	44	26	12	19	77	39	
	yes	52	51	85	84	83	83	134	63	
none	no	60	70	56	32	18	30	68	40	
	yes	59	63	64	59	58	67	103	62	

Table 2. Soil $\text{NO}_3\text{-N}$ (0-2 ft) following small grain harvest at Morris as affected by tillage.

Tillage Used		Sampling Date (1994)							
		8/4	8/18	8/31	9/14	9/28	10/12	10/26	11/8
		----- lb. $\text{NO}_3\text{-N}$ /acre -----							
	chisel	43	60	52	54	56	63	64	73
	none	39	47	48	52	67	56	62	70

Drying and Storing 1995 Small Grain

The primary post-harvest concerns for small grains this year are high temperatures at harvest and, in some cases, the presence of scab.

When small grains are harvested at a moisture content greater than 14%, artificial drying is necessary. Gas-fired drying is usually fast and reliable, but keep the heat down to preserve grain quality. Adjust the dryer air temperature to keep kernel temperature below 140°F for milling wheat and below 110°F for seed wheat.

Normally, natural-air drying is a good alternative to gas-fired drying, but beware that risk of spoilage in damp grain is high during warm weather. Mold is likely if grain wetter than about 16% moisture is held for very long when average daily temperatures (add night time low to the day time high and divide by two) are greater than 65°F. It might be better to use gas-fired drying if you need to harvest wet grain during warm weather. If natural-air drying is the only option available, it would be best to delay harvest until grain moisture and/or outdoor temperatures drop. Get a copy of Minnesota Extension Service FS-5949, *Wheat and Barley Drying*, for more information.

Once grain is dry, try to cool it to less than 60°F as soon as possible. At this time of the year, when day time temperatures are still high, it might be necessary to con-

trol aeration fans using a thermostat, or to just run fans at night to adequately cool grain. Don't worry about the higher relative humidity associated with night time air - cooling occurs much faster than rewetting does. Later on this fall, operate fans to cool grain to about 40°F, and then run the fans again in late fall to cool grain to about 25°F for winter storage.

Limited laboratory research on storage of scab-infected wheat indicates that at some moisture levels scab causes wheat to deteriorate slightly faster than sound wheat. If you clean wheat before filling bins, storage risk will be reduced slightly. But the difference in storage life between sound and scabby wheat appears to be relatively small, so there shouldn't be any problem with storing scabby wheat if good management is used. If you can't clean scabby wheat before storage, at least use a spreader when filling bins to distribute fines and chaff. Or, as an alternative for bins that don't have spreaders, pull the centers out of the bins to remove fines and chaff that accumulate under the fill spout. After bin filling, aerate scabby grain just as you would sound grain to cool it as quickly as possible after harvest.

Bill Wilcke
Biosystems and Agricultural Engineering

Corn Diseases

Corn "US corn gene pool dangerously narrow" says Dr. L. Pollak of the USDA-ARS. The figure given is that the entire US corn production is based on only 5% of the available genetic material in the world. The genetic base of the corn hybrids grown is a good one when you consider the yield levels achieved, however a narrow genetic base is a serious problem and the industry has begun to deal with this issue. Five major seed companies, the American Seed Trade Association and USDA-ARS scientists are looking at hundreds of exotic germplasm selections from over 12,000 corn populations in the GEM Project (Germplasm Enhancement of Maize). A large number of companies and public cooperators are participating. One area that could benefit from this type of effort is the development of corn lines with new and better resistance to corn foliar diseases. In Minnesota, Eyespot and Northern Leaf Spot are often seen and Gray Leaf Spot is also a problem. The weather conditions—wet or humid and warm to cool—are all that is needed to allow these diseases to develop. Gray Leaf Spot, "a disease on the move" can limit corn yields. Northern and Eyespot also have the potential to reduce yield and increase the level of stalk breakage/rot.

Why are we seeing more foliar corn disease? One reason is many lines have little to no resistance and the

second is the widespread use of reduced tillage which allows the fungus to survive the winter and spread to corn. The conservation tillage practices, short rotations and susceptible corn lines allow these fungi to overwinter, produce spores that can be rain or wind borne to other fields. The weather conditions that favor these disease are just the normal high humidity, overcast periods with heavy dew formation. Late season scouting is needed to determine if these leaf problems are present in your fields. Gray Leaf Spot was reported in 1994 in SE MN and we had widespread reports of both Northern and Eyespot. Pioneer hybrids reported to perform well where Eyespot is a problem are: 3751, 3733, 3730, 3578, 3563 and 3531. Consult with seed corn companies for additional information on resistance to foliar disease.

Soybeans The symptoms of "White Mold" continue to increase. Wet, humid conditions with temperatures less than 80°F allow this pathogen to colonize more of the soybean plant. Dead or dying plant tops and stems with patches of cottony white mycelium were evident the end of July in some locations. I expected to see more damage in plots with susceptible lines, however the hot weather may have slowed the disease development. Reports from the field suggest more symptoms are being reported in

Corn Diseases/Continued

drilled beans than in wider rows. In 1994 the unexpected high plant populations/small seed size and considerable vegetative growth resulted in high levels of White Mold in nearly all fields, while for now it appears that drilled beans may have, if not more disease, at least disease being reported earlier. This is also seen in plots at Northfield, Minnesota where under natural inoculum conditions the most disease was observed in 12 inch row plots of a sus-

ceptible and little disease was recorded in plots with cultivated 30 inch row of the same variety. This observation may change as more infection can be expected in this season. However the early infection is believed to do the most damage.

Ward C. Stienstra
Extension Plant Pathologist

Cabbage & Cole Crops

Cabbage Looper ALERT #2 — Looper moths are still being caught south of the Twin Cities in record numbers this year, with very high egg-lay, and close to 100% of the plants infested in untreated check plots at Rosemount. Use the high rate of one of the pyrethroid products... and consider a tank-mix with Lannate to improve ovicidal

control of looper eggs. The *Bacillus thuringiensis* (B.t.) products will not provide consistent control of loopers under these conditions.

Bill Hutchison
Extension Entomologist

Sweet Corn

European corn borer Alert #2 — The second generation ECB flight is well underway, with moth catches at most locations **MUCH HIGHER** than in the past 4 years; we are definitely on the upswing again of our 6-7 year cycle of low and high regional ECB population dynamics (see the Table below which summarizes light trap

catch data for Minnesota). In addition to the counts shown in the table, 2 of our light traps at Rosemount (Dakota Co.) peaked at approx. 600 and 830/night, respectively, on August 4th, similar to peaks recorded for other locations.

ECB Light Trap Catch Summary for Aug. 2-8, 1995

Location	No. of Nights	Peak Catch (Date)	Avg. No. Moths/Night
Crookston	4	1 (--)	0.5
Fergus	5	5 (--)	1.6
Morris	7	29 (8/2)	17.1
Lamberton	7	8 (8/4)	4.0
Jeffers (SW)	4	43 (8/7)	27.5
Olivia	7	141 (8/4)	41.8
Blue Earth-1	7	1063 (8/4)	402.1
Blue Earth-2	5	1556 (8/5)	718.8
Le Sueur-E.	7	266 (8/3)	195.1
Sleepy Eye-1	7	140 (8/3)	45.7
Sleepy Eye-2	7	300 (8/4)	138.1
Waseca-UofM	3	253 (8/4)	153.7
Waseca	5	102 (8/4-5)	96.6
Simpson (SE)	6	23 (8/7)	14.5

**Data provided by numerous volunteers and summarized by Dharma Sreenivasm (MDA) and WDH.*

Not too surprisingly, egg lay has hit record levels in the Le Sueur and Rosemount locations, averaging 75-100% of the plants with at least one ECB egg mass! Many plants at both locations also had 2-3 egg masses, with one at Rosemount with 7 egg masses. Eggs were found on the upper surface of leaves, on ear shoot leaves and directly on the stalk, as well as the underside of leaves. Moths were easily found in adjacent soybeans (acting as

the day-time "action site".... where moths will feed and mate during the evening, before moving to nearby corn to oviposit; note that alfalfa as well as grassy/weedy areas will also serve as action sites; if you do not have a local trap for monitoring, scaring up moths in these sites (during the day) is another good monitoring method).

Most of the egg masses are still fresh (1-2 days old). Yesterday was the first time that we saw a significant

number of egg masses starting to hatch (Le Sueur) and/or show black-head stage larvae (Rosemount), indicating they are close to hatch. However, at Rosemount, 95% of the egg masses should not hatch until Aug. 12-14th, with current temperature conditions.

ECB Management Options — Given the high pressure we are seeing for sweet corn, growers/processors should strongly consider going with the maximum rate of one of Pounce, Ambush (0.20 lb AI/ac) or Warrior (0.025 lb AI/ac) for your first or second spray for this flight, for tassel to early-silk corn....OR, if you can go to a 5-day spray interval, you can stay with the mid-rate of each (0.15 lb AI/ac for permethrin or 0.025 lb AI/ac for Warrior).

Also note, we are seeing distinct differences in oviposition preference among sweet corn plantings; those MOST ATTRACTIVE are in the early-tassel (or green tassel just emerging from the whorl), row-tassel and first-silk growth stages....with much lower egg-lay in adjacent silking fields showing brown silks. Remember to strongly consider the growth stage of the plant in scheduling your egg sampling efforts, and/or prioritizing which fields to invest in higher rates of insecticide. Also note, that fields with brown silks or within 7 days of harvest should not be treated (again) as any newly hatching larvae will not gain enough size to be a problem at harvest.

Bad News: The Degree-day accumulation as of August 7, 1995, was only averaging about 1730 DDs for south-central Minnesota. For 3 of the past 4 years (1991-1994), this level of heat accumulation indicated we were only at 5-20% of the total moth flight (cumulative emergence). In one year (1993), 1700 DDs = 55% (peak) emergence. Given the extended first generation flight in many areas this summer, with distinct cohorts (groups) of eggs hatching at different weeks, I would say the chances are very good that we will see an extended 2nd generation flight this year. All sweet corn and seed corn will need to be monitored very carefully throughout the remainder of the season. With the magnitude of the pressure for this flight, I would guess that many dent corn fields will need to be scouted for 2nd generation ECB as well.

The Good News (?): We still have not detected significant Corn Earworm flights in Minnesota. At most, our traps are picking up 1-2 moths/week at Rosemount. Again, these moths typically come in during late August; Aug. 24th, plus/minus 4 days. Note that their arrival is independent of degree-day accumulations, but more dependent on the senescence of corn in the southern states, probably Texas, Oklahoma, etc.

Bill Hutchison
Extension Entomologist

Corn Rootworm Emergence Underway

Corn rootworm emergence peaked this week, judging from emergence cages in my study sites near Rosemount. Males typically emerge earlier than females. The females take another two weeks to sexually mature, mate, and begin laying eggs. Populations generally increase for two weeks, stabilize for two to three weeks and then decline as the field and beetles age. The next two to three weeks should provide prime time for scouting corn rootworm beetles to predict the need for soil insecticides next year.

Why scout corn rootworm adults? There are three reasons to scout corn rootworm beetles. First, adult feeding can reduce pollination. Second, adult monitoring can be used to time adult control with insecticides. Third, adult density can predict likely damage to corn next year. The optimal time for these first two purposes is over for most fields.

When is silk clipping a concern? Corn silks and pollen are primary food resources for beetles. Heavy feeding on silks that leaves less than 1/2" exposed during pollen shed can dramatically reduce kernel set and yields. Silk pruning commonly occurs when beetles concentrate on early silking or delayed silking plants. Economic losses are rare unless severe pruning by high populations (typically >

10/plant) accentuates drought-related pollination problems. Treat field corn only when silks are pruned to less than 1/2" and less than 50% of the plants have silked. Hybrid seed fields need to be monitored more closely and treated more aggressively.

Can egg laying be prevented by controlling adult beetles? Well-timed insecticide applications can prevent egg-laying and eliminate the need for soil insecticide the following year. Remember though that the objective is not kill but reduction in egg laying. That lesson was driven home in 1993-4 when I used Compel (an insecticide-cucurbitacin bait) to achieve 85% beetle control with no reduction in root rating. The application was late...after substantial egg laying took place. Thresholds for adult control are 1 beetle per plant (whole-plant count) and 10% females with eggs. We have reached this point in most fields in southern Minnesota. Corn rootworm adult are easy to kill with a wide variety of insecticides (see BU-0500 *Insecticide Suggestions for Insect Pests of Field Crops* for a list of recommended insecticides.) Retreat the field if counts reach 1 beetle per plant again. Given the long period of adult emergence, two applications are likely to be required.

Corn Rootworm Emergence/Continued

Can scouting predict the need for soil insecticides? A five year study from 1989-1994 indicates that fewer than 50% of the fields where corn follows corn suffer damage that justifies a soil insecticide. Widespread absence of yield benefits means that insurance use of soil insecticides costs growers \$6-12 per acre. Adult scouting provides a reliable way to predict which fields are not likely to benefit from soil insecticide use. The two primary scouting methods are whole-plant counts and sticky traps. Either technique will work although I personally have more confidence in whole-plant counts. Minnesota research

indicates that whole-plant count of 1.4-1.5 beetles per plant corresponds to root injury rating (Iowa scale >3.0) the following year. To play it slightly conservative a threshold of 1.0 beetle per plant is recommended at this time. For the unbaited Pherocon-AM sticky trap, a threshold of 3.7 beetles/trap/day is recommended. If you would like more information on either of these scouting methods, call me at (612) 624-9272 with your request or contact your local extension office.

*Ken Ostlie
Extension Entomologist*

Dial U

Dial U is a user-fee telephone diagnostic clinic for calls and samples related to gardening, landscapes, plant diseases, insects and wildlife associated with the home environment. Calls from the public are taken at 1-900-988-0500 weekdays. A flat \$2.99 charge is billed automatically to the phone from which the call is placed.

Black Rot

Cole crops, especially cabbage, cauliflower, broccoli, turnip and Brussels sprouts are susceptible to this bacterial disease. The bacterium may enter the plant at any stage of growth through the water pores around leaf margins. Infected tissue turns yellow from the edge toward the center of the leaf forming a V-shaped pattern, while the veins within the yellow area turn black. Meanwhile, the bacteria move down the leaf and throughout the plant. Infected leaves turn yellow and drop off. Stems, when cut crosswise, reveal a black ring where infection has followed the water conducting tissues.

The bacteria overwinter in and on seed and in plant debris left in the garden and are easily spread by splashing or running water, insects, and infected transplants. Prevent black rot by planting western-grown seed which has been hot-water treated; by keeping the garden clean of plant debris and weeds; and with a minimum 3 year crop rotation.

*Cynthia Ash
Assistant Plant Pathologist*

Blow Flies

Many callers have experienced the sudden appearance of large numbers of flies within the home. What initially sounds like an ordinary house fly should be questioned. If descriptions include sudden large populations, metallic green or blue coloring, and an attraction to window screens, the client may be dealing with a blow fly.

Blow flies feed and breed upon animal carcasses. The focus of indoor pest control should be to eliminate the food source. Thoroughly search for small rodents in nooks and crannies. If there are cats in the family, consider the possibility of presents brought by the proud mouser. Meat scraps or animal and human feces in an open can (or diaper pail) would serve also as appropriate breeding sites. If after careful investigation obvious sources cannot be found, consider the possibility of a dead animal in a wall void.

Providing there are no additional food sources, the problem will be temporary. Take steps to contain garbage and eliminate other food sources. Place fly strips to help control the adults. Because they tend to congregate in window areas, vacuum the sill thoroughly and dispose of the vacuum bag immediately afterward. If the problem persists, a pest control operator may need to be contacted to help with the possibility of animal nests within the home wall void spaces. We have found, however, that the initial population explosion is not followed by another. It is plausible to expect that the flies eat themselves out of a food source rather quickly.

*Valerie Doying
Entomology Technician*

Dial U Identifications

Quite a few of our calls this time of year deal with plant identification. Sometimes people see a particularly attractive flower, tree or shrub and want to grow it themselves. In order to get the seeds or buy the plant, they need to know the correct name. Unfortunately, sometimes the plants are from different parts of the country, with bits brought back from vacations. Again identification is important as many plants thrive in milder climates but just don't perform well here.

Another common reason for identifying plants is to check their edibility or possible toxic effects on people (or pets). Wild fruits from vines, trees or shrubs in the woods often look quite delectable, regardless of their true edibility. People also send in black walnuts, hazelnuts and once in a while, hickories of one sort or another.

Some fruit—honeysuckle berries, for example—are not poisonous, but neither are they tasty enough to consider them edible. Other berries—such as white or red baneberry, common woodland plants—are extremely poisonous and pose a real threat to young children who might be attracted by their color. The dark blue-black berries of common buckthorn won't kill you, but would make you sick as a dog.

We **do not** even attempt to identify mushrooms at Dial U, but refer callers to the Minnesota Mycological Society, a group of dedicated amateur mushroom hunters.

Finally, we do a lot of identifying plants as to their status as weeds or desirable plants. "Are they wildflowers or just weeds?" And if they're weeds, "how do I get rid of them?" We often remind people that whether a plant is a weed or not depends on where it's growing and whether or not they like it. Chemical control also depends on knowing specifically what type of weed it is, or at least having a clear idea of whether it's an annual or perennial.

Samples sent to Dial U for identification must be accompanied by a check for \$2.99 and a note with as much information about the plant as you can supply. There is no charge for master gardeners who are finding information to help Extension clientele. (Dial U, 155 Alderman Hall, University of Minnesota, St. Paul, MN 55108)

Deborah Brown
Extension Horticulturist

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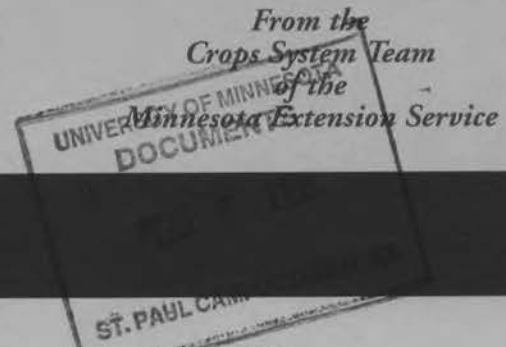
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CROP**NEWS****Are Grain Yield Monitors Important?**

One of the new tools developed for precision agriculture in the past few years has been the grain yield monitors for combines. There are several reasons why a monitor may be a good tool for a farmer.

1. Documenting problem areas in a field
2. Adjusting inputs within the field from an economic aspect.
3. Long range record keeping.
4. Measuring relative differences in yield as affected by soil properties, etc.

The cost at this time is about \$3000 for the monitor and \$4000 for the locating equipment plus the cost of processing the data collected.

At this time, technology seems to be driving the use of this equipment. One proposed use is for establishing yield goals for fertilizer application rates. Research on grain yield variability within a field is slim. A number of studies have been initiated and have data for two years. Preliminary results are somewhat startling. For any given part of the field, yield potentials are not the same year to year (ie, the high or low grain yields are not in the same place year to year). This may be explained by a number of factors affected by climate. For example if the two years were 1993 and 1994, the growing conditions went from the poorest (1993) to the best (1994). For fertilizer recommendations longer term information is needed. How long is not known. In a four year study on irrigated sandy soils in Minnesota, there was no relationship between any of the years grain yield in continuous corn with uniform applications of inputs (N, P, K, herbicide.....).

The take home message of this short article is to be aware of the grain yield data you collect from a monitor.

1. There is a danger that we may get too concerned about

small differences in yields in any given field, spend a lot of money to correct the differences, and not get any return for money spent.

2. Another concern is using yield data from only one year is dangerous. We may end up chasing ghosts. Using one-year's data may be very useful in understanding production problems encountered each year, but do not base future production decisions only on this information.

Grain yield monitors may be considered as starting point for getting into "precision farming". To make the most of this technology it will have to be used with other components to the technology package. This also costs dollars. As yet, economic return from such investments has not been well documented. Much more research is needed to identify the causes of yield variability within production fields before a firm decision on this technology can be made.

*John Lamb and George Rehm
Extension Soil Scientists*

Highlights...August 4, 1995

*Are Grain Yield Monitors Important?
Manure Management Planning Software/
Training
Compost and Land Application Field Day
Colorado Potato Beetle
Dial U
Late Season Defoliators
Potential Beetle Pests
Bacterial Wilt Common in Many Gardens.
Fertilizing Garden and Landscape Plants
Is It Voles, Moles or Shrews???*

Manure Management Planning Software/Training

Manure management is an integral part of all livestock producers' operations. Economic, regulatory, and agronomic issues all confront producers in how to best manage their manure. The University of Minnesota, with assistance from the Minnesota Pollution Control Agency and the Minnesota Natural Resource Conservation Service, has just released a new version of the Manure Application Planner (MAP). This software allows for cost-efficient and environment-friendly nutrient management planning.

Manure source quantity and analyses, field nutrient needs and nutrient sensitivity, and nutrient pricing and application cost (from both fertilizer and manure) information form the main categories of program input. Program subroutines and help screen can help provide all of this input information. A unique optimization program then calculates application rates while "looking" at all fields on the farm at the same time. Output includes manure and fertilizer application rates, total nutrient quantities needed, residual available N from the manure, excess nutrients applied from the manure, leftover stored manure (if any), and nutrient costs for each field with and without the use of the manure, which include application/hauling costs.

This software is being offered through the Center for Farm Financial Management, which is on the St. Paul campus, and costs \$95. A one-day (10:00-3:00) training session will be offered in three cities around the state to acquaint new and existing users of MAP to the agronomic principles of the program (presented by Mike Schmitt, Dept. of Soil, Water, and Climate) and the economic/operation issues of the program (presented by Dick Levins and Wynn Richardson, Dept. of Applied Economics). These cities and dates are: Alexandria (8/15), St. Paul (8/25), and Mankato (9/7). Registration is required and is being handled by Jane Sandstrom at the Center for Farm Financial Management (612/625-1964 or 800/234/111).

While the software can be run by just using the on-screen help keystrokes, the comprehensive Users Manual, and the 800 number help line, the training sessions may provide some additional experience and user skills. Although the software is primarily written for Extension and agency personnel, consultants, instructors, and other ag professionals, several crop producers have purchased the software as well.

Mike Schmitt
Extension Soil Scientist

Plant Disease Clinic Report

Samples submitted to the clinic in July included:

soybean—*Pythium* sp., *Fusarium* sp., & *Rhizoctonia* sp.
root rot
Septoria sp. leaf spot
soybean cyst nematode
navy bean—*Fusarium* sp. root and stem rot
wheat—*Fusarium* sp. and *Bipolaris* sp. root rot
potato—Early blight
alfalfa—*Leptosphaerulina* sp. leaf spot
carrot—*Rhizoctonia* sp.
cauliflower—Club root
cabbage—*Pythium* sp. stem rot

tomato—*Verticillium* sp. wilt
strawberry—*Rhizoctonia* sp. root rot, winter injury
apple—Scab
elm—Dutch elm disease
oak—Oak wilt, anthracnose
geranium—*Pythium* sp. root rot
rose—*Cylindrocladium* sp. stem rot
cyclamen—*Botrytis* sp. petiole rot
statice—*Pythium* sp. crown rot
columbine—bacterial soft rot
N.G. impatiens—Impatiens necrotic spot virus
dianthus—*Alternaria* sp. leaf spot

Compost and Land Application Field

Municipal solid waste compost and yard waste land application research field day - Sand Plain Research Farm, Becker, Minnesota, Wednesday, August 23, 1995, 11:00 a.m. - 12:30 p.m. For more information, call Tom Halbach, (612) 625-3135.

*Tom Halbach
Extension Specialist - Water Quality/Waste Management*

Colorado Potato Beetle (CPB)

This week we examined a large number of fields of late potatoes treated with Admire in the Hasting, MN to Clear Lake (Anoka sands) region. Without exception all fields had very low to low numbers of late instar second generation CPB larvae, as well as adults in modest numbers. In almost all cases there are not enough CPB numbers to cause economic injury. In perhaps 30% of these Admire treated fields there are 1st and 2nd stage larvae which would suggest sublethal levels of Admire metabolites in the potato plants at this time.

There are enough fields with 4th stage, and no 1st and 2nd stage, to suggest earlier insecticide selection for the larval stages. Thus many fields selected adults and larvae in two different generations this season. We should remember that the high dosage (ie when potatoes emerged) asserts the greatest selection pressure for Admire resistance, if a resistance gene for imidacloprid (Admire) is present. As the total toxicity levels in the plant decline selection pressure for CPB resistance to CPB also declines.

*Dave Noetzel
Extension Entomologist*

Dial U

Dial U is a user-fee telephone diagnostic clinic for calls and samples related to gardening, landscapes, plant diseases, insects and wildlife associated with the home environment. Calls from the public are taken at 1-900-988-0500 weekdays. A flat \$2.99 charge is billed automatically to the phone from which the call is placed.

Late Season Defoliators

Watch for insects feeding on trees and shrubs in August and September. Common examples include whitemarked tussock moth caterpillars, fall webworms, red-humped caterpillars, mountain ash sawfly larvae, and pear slug sawfly larvae.

In most cases, insect feeding causes little long-term injury to trees and shrubs, especially if they are healthy and well-established. If, however, they are recently transplanted or unhealthy, insect feeding in August can injure them. Complete defoliation may cause the plant to put out a new flush of growth which uses energy it needs for next year's growth plus leaving it more susceptible to branch dieback when cold weather arrives. Defoliation in September is less important as landscape plants get closer to losing their leaves.

If it is necessary to control these insects, treat when the insects are no more than half their full grown size. If the insects are already full grown or nearly so, it is too late treat them. The goal is to minimize damage to trees and shrubs, not whether you can kill the insects. Spraying full grown defoliators in late summer or fall does not influence how many you'll find next year.

If you spray, use one of the following insecticides on small larvae: *Bacillus thuringiensis* var. *kurstaki* (for caterpillars only), insecticidal soap, acephate (Orthene), malathion, diazinon, chlorpyrifos, carbaryl (Sevin).

Potential Beetle Pests

Picnic beetles, or sap beetles, are potential pests in gardens. They are 1/4 inch long, black with four orange spots. These beetles are attracted to fermenting or souring smells and are found in gardens on overripe and rotting fruits and vegetables, especially corn, melons, berries, and tomatoes. Once in the garden, picnic beetles can also attack nearby food that is still ripening.

The best control is to pick produce as it ripens and dispose of any overripe fruits and vegetables. Products that are overripe or rotting attract picnic beetles into the garden. Once there, they are difficult to control. Spraying insecticides may temporarily control picnic beetles, but the waiting period (in days) to allow insecticide residues to break down prevents immediate harvest. By the time it is safe to pick fruits and vegetables, new picnic beetles usually have already come back into the garden.

Jeffrey Hahn
Assistant Extension Entomologist

Bacterial Wilt Common in Many Gardens.

Bacterial wilt, caused by the bacterium *Erwinia tracheiphila*, affects cucumbers, muskmelons, squash and pumpkins. Initially individual leaves wilt followed by collapse of the entire vine. The disease is vectored to cucurbits by cucumber beetles which introduce the bacteria into the water conducting tissues (xylem) during feeding. The bacteria multiply rapidly, plugging the water conducting tissues, resulting in wilting of the vines. The presence of this disease can be confirmed by cutting through the stems, placing the cut ends back together and slowly pulling them apart. If bacteria are present in the tissues, short strings (1/4-1/2 inch) will form between the cut ends. Infected plants should be removed immediately. Since the bacteria overwinter in the cucumber beetle and are subsequently spread by them, control is aimed at the beetle. Apply insecticides early in the growing season for successful beetle control. For small patches, protective cloth barriers can be used to keep the beetles from feeding on the plants.

Cynthia Ash
Assistant Plant Pathologist

Fertilizing Garden and Landscape Plants

Dial U always gets a lot of questions about using fertilizer; this year is no exception. In fact, because of heavy rains in many parts of the state during July, it's quite obvious that many plants need additional fertilizer. Their newer foliage may be distinctly lighter green than older growth.

In some cases foliage turns pale green between the veins while retaining good color on the veins and immediately adjacent to them. This is typical of iron chlorosis, but may occur when soils are saturated and plants are unable to absorb the mineral nutrition they need. (If iron chlorosis develops annually, it's a sign that the plant isn't really suited for that particular site and soil type. It's probably best to bite the bullet and replace it with one more suitable—long term solutions to iron chlorosis are nearly impossible.)

Roses and other woody ornamentals may be fertilized one final time in early August. Beyond that it's best to hold off feeding as it encourages new growth at a time you'd rather the plants begin the process of hardening off for winter.

Shade trees should be fertilized now only if they need it desperately; in most instances you'd be better off having them fertilized late in autumn so the nutrients would be in place when they're needed next spring. On sandy soil, in fact, it's best to wait for spring to fertilize trees and shrubs. A heavy snow melt or early spring rains could drive the fertilizer deep into the soil where plants' feeder roots would be unable to access it.

Flowering annuals such as impatiens and petunias benefit from regular, mild fertilizing throughout the growing season. Since they'll die at the end of the season anyway, you needn't worry about prolonging active growth versus allowing them to harden off for winter. Active growth is what you want for all annual plants, flowers **AND** vegetables.

Perennial garden plants, whether peonies or rhubarb, do better with spring applications of fertilizer.

Deborah Brown
Extension Horticulturist

Is It Voles, Moles or Shrews???

If you've noticed shallow underground tunnelling or pressure ridges in your lawn or garden you could have voles, moles or shrews. Knowing which animal is present is crucial in determining what eradication measures to take.

Voles, also known as meadow mice, construct underground and surface runways in association with many surface holes or entrances. Close inspection in and around the runway reveals small grass clippings and an occasional cluster of dry grasses in a loose ball. Voles also leave winter damage evidence as they make nests between the grass and the snow, sometimes killing the grass in patches. Control voles by trapping them with mouse traps placed adjacent and perpendicular to active runways. Bait the traps with a mixture of rolled oats and peanut butter.

Moles also construct surface pressure ridges. However, they also often produce noticeable mounds of loose soil. Moles rarely travel above the surface of the ground unlike voles and shrews which are often seen running quickly near activity areas. Control moles with the aid of a harpoon trap. Harpoon traps are found in hardware and farm/garden stores.

Shrew damage is much like that of a vole. However, close inspection of the runways does not reveal grass clippings. Entrance holes are more noticeable and are up to 2" in diameter. Like the vole, shrews are controlled with mouse traps placed near active sites. Appropriate baits include peanut butter, chocolate, bacon, ham, or raw beef.

*Julie Wermerskirchen
Wildlife Technician*

MINNESOTA EXTENSION SERVICE

UNIVERSITY OF MINNESOTA
COLLEGE OF AGRICULTURAL, FOOD,
AND ENVIRONMENTAL SCIENCES

Produced by the Educational Development System, Minnesota Extension Service.

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CROP**NEWS**

From the
Crops System Team
of the
Minnesota Extension Service

JUL 31 1995

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Alfalfa**Potato Leafhopper**

PLH populations continue to soar throughout southern Minn.....the good news is that PLH are relatively easy to control with most labelled insecticides. Again, fields that are yellowing but still 10-14 days away from harvest should be treated with an insecticide **AND NOT SIMPLY HARVESTED!** Harvesting only will not usually control PLH... i.e., a grower will still have to come back and spray the field after the cutting to control PLH on the regrowth. Even if the plants are severely stunted, an insecticide treatment **NOW** will relieve the PLH-induced stress immediately and allow the alfalfa to recover rapidly and produce a very good yield. The harvest will be somewhat delayed because of the stunting, but it will be there. The following regrowth/crop will still need to be monitored as well, and treated as a separate crop.

This is also true for newly seeded alfalfa. To optimize insecticide returns on new seedings, wait to spray when PLH nymphs are present, rather than using only the traditional thresholds of 0.5 to 2.0 adult PLH/sweep. In a 2-year study, Eric Flora (M.S. student) found that this single spray yielded as well as 2 or more applications for the total yield of 2 cuttings during the establishment year (and no differences in quality). The single spray resulted in significant yield gains over the untreated check plots (100% yield increase), with a \$13.00/ac return for every \$1.00 per acre invested in insecticide.

The only two materials **I do not recommend** for PLH on alfalfa include Sevin and malathion (Cythion); these

materials have minimal residual activity, resulting in a good initial knockdown kill of PLH, but poor residual control of new nymphs hatching from the stems. In contrast, all other materials (at the mid rate) do provide good residual control.

Bill Hutchison
Extension Entomologist

Highlights...July 28, 1995

Alfalfa - Potato Leafhopper
Corn & Sweet Corn
European Corn Borer ALERT!
Cabbage, Broccoli & Related Cole Crops
Cabbage Looper ALERT!
Carrots - Aster Leafhopper
Preharvest Weed Control In Small Grains
Soybean Diseases
Dryness, Heat, And Corn Yield
Colorado Potato Beetle
Sunflower Beetle Control
Dial U
Large Spiders
Heat-Related Garden and Landscape
Questions
Dodder
Mole Patrol

Corn and Sweet Corn

European Corn Borer ALERT!

In addition to the ECB activity I mentioned last week for west-central Minnesota, the second generation flight of ECB is now underway in most south-central Minn. locations, with up to 30 moths per night in some pheromone traps. All sweet corn in the tassel to silk stages will be attractive for ECB egg-lay. Eggs are most often laid on the underside of leaves about 18 inches above and below the primary ear. Eggs, however, may also be laid on ear leaves, or closer to the tassel area. Examine at least 7

sets of 10 consecutive plants each, per 20 acre field, and make spray decisions only if 4-5% of the plants have at least one egg mass and/or young larvae (e.g., early instars). (**Note:** This same threshold applies when corn earworm eggs and/or larvae are also present, but again, as of this week, we have not yet trapped any CEW moths in our traps.)

Bill Hutchison
Extension Entomologist

Cabbage, Broccoli, and Related Cole Crops

Cabbage Looper ALERT!

Cabbage looper (CL), our most damaging lepidopteran pest of cole crops in the state, is now present at **VERY HIGH** infestation levels! Moth catches have been up to 20-40/night in pheromone traps (7/night is indicative of an economically damaging infestation) and in untreated check plots at Rosemount, eggs and all larval sizes are present on approx. 80% of the plants. CL is particularly damaging during warm weather because the larvae will more often burrow into the developing head to escape the heat; in cooler weather they will usually stay on the wrapper leaves and subsequently do less damage overall. Growers who have used *Bacillus thuringiensis* (*B.t.*) products thus far this year (for diamondback and/or imported cabbageworm) should now switch to more conventional materials such as the pyrethroids (refer to the

1995 Commercial Vegetable Pest Management Production Guide—BU-1880—for labelled products and the early July issue of this newsletter for new products recently registered).

Fields that are cupping, or in the early head stage should be treated when 10% of the plants are infested with CL and/or the other lepidopteran pests are present (with one or more individuals present per plant; it is not necessary to count every individual insect per plant; again refer to the Veg. Guide for details on this faster presence/absence monitoring method).

Bill Hutchison
Extension Entomologist

Carrots

Aster Leafhopper

ALH populations remain high in the Anoka area, and our most recent estimate of aster yellows incidence in ALH was 4.8% of adults being infective (Dr. Bantarri, Dept. of Plant Pathology) indicates monitoring and possible insecticide applications may still be necessary for any carrots that are still more than 3 weeks away from harvest. See the 1995 Comm. Veg. Guide for details on the Aster Yellows Index to determine if a spray is warranted ($=\% \text{ infectivity} \times \text{the avg. number of ALH/100 sweeps}$).

Also note: severe infestations of carrot weevil were found in the Anoka area this summer. To document the extent of the infestation, I would appreciate any calls from growers who see damage in their fields (even if limited). I can be reached at 612-624-9272. Carrot weevil, as white grub larvae, feeds and tunnels directly on the carrot root, usually near the top of the root. I have a limited supply of Michigan State fact sheets on this pest for those who are interested.

Bill Hutchison
Extension Entomologist

Preharvest Weed Control in Small Grains

We have been receiving many questions on preharvest weed control in small grains. Late emerging broadleaves and grasses will be causing harvest problems in many fields. However, it is important to keep preharvest weed control in small grains in perspective. The following are some factors to consider before applying a herbicide as a harvest aid:

1. The expectations for preharvest weed control usually exceed reality - it is not possible to kill/dry down a 3-foot weed in the same manner as a 3-inch weed. Lower portions of the weed may not be affected.
2. It requires time to dry down treated weeds - usually 7-10 days. It may require more time if wet and/or cool weather conditions occur after treatment. All herbicides labeled for preharvest application are systemic and slow acting which requires a longer dry down period as compared to contact, fast acting herbicides.
3. The intent of a preharvest treatment should be to facilitate harvest and reduce harvest loss. Preharvest treatments do not decrease yield losses due to weed competition or prevent weed seed production.
4. Herbicide drift from preharvest treatments can cause major problems this time of year. Consider sensitive crops (sugarbeets, potatoes, etc.) and other plants (trees, gardens, etc.) in the general vicinity of the field receiving treatment.

The following is a list of herbicides labeled for preharvest treatments in small grains and precautions on their use.

- A. There are no herbicides labeled as a harvest aid for use on oats.
- B. 2,4-D is labeled as a harvest aid in spring wheat, durum, barley, and rye. Labels vary in crop use. Follow the label.
- C. Banvel is labeled only in North Dakota as a preharvest application in wheat and durum applied alone or in a tankmix combination with 2,4-D.
- D. Ally is labeled as a preharvest aid in wheat, durum and barley alone or with 2,4-D or on wheat and durum with 2,4-D and/or Banvel. Intended for use in a winter/spring wheat or wheat following rotation. Must follow crop rotation restrictions.
- E. Roundup, Roundup RT, or Landmaster BW is labeled as a harvest aid in spring wheat and durum **ONLY**—not barley or oats.
- F. Paraquat is **NOT** labeled as a harvest aid in small grains. **DO NOT** use it. Not only is it illegal, it is not effective.

2,4-D as a Harvest Aid:

If broadleaf weeds are going to interfere with harvest, 2,4-D can be applied at 0.75 to 1.5 lbs/A (1.5 to 3 pts/A of a 4 lb/gal a.i. product) at the dough stage of spring wheat, barley or rye. Not all 2,4-D formulations are labeled for preharvest applications.

Some 2,4-D labels only allow use on wheat, others allow use on wheat and barley and others allow use on wheat, barley and rye. Choose a brand that is labeled for use on the intended small grain crop. An ester formulation will give better control and quicker burndown than an amine formulation. If using an ester formulation, use a low volatile formulation to reduce vapor drift potential. If using an amine, at least 2 pts/A is needed for larger weeds. Do not expect good control on large pigweed or kochia or wild buckwheat. Large kochia and other weeds with large stems may not burn down and may stay green for an extended period.

2,4-D can be tank mixed with Roundup on spring wheat and durum for additional broadleaf control and grass control. See the following paragraph for restrictions and read the Roundup label.

The labels of most formulations of 2,4-D have a grazing restrictions of no dairy and 7 days for meat animals and a 30 day hay restriction. Do not feed straw to livestock.

Banvel + 2,4-D as a Harvest Aid: (Banvel is only Labeled in North Dakota - Not Minnesota)

Apply Banvel at 0.5 pt/A + 2,4-D at 1 to 2 pt/A when wheat is in the hard dough stage and the green color is gone from the nodes of the stem. Banvel will provide additional control of wild buckwheat, kochia, common lambsquarters, pigweed spp., sunflower, and Russian thistle. A waiting period of 10 to 14 days is required before harvest. Do not feed treated straw to livestock. Caution: Drift to broadleaf crops is especially hazardous at this time.

Ally + 2,4-D as a Harvest Aid:

Apply Ally at 0.1 oz product/A + 1.5 to 3 pt/A to wheat, durum, and barley in the dough stage and at least 10 days prior to harvest. For use in wheat/fallow or continuous wheat rotation. Do not use if crop was treated previously with another sulfonylurea herbicide. For wheat, Ally + 2,4-D can be tankmixed with Banvel for faster dry down and for weed resistance management. Follow the label for crop rotation restrictions and refer to the 2,4-D and/or Banvel label for grazing restrictions.

Small Grains/Continued

Roundup and Roundup RT (glyphosate) as a Harvest Aid:

Roundup and Roundup RT can be applied at 0.5 to 2 pts/A for annual grass and broadleaf weed control, quackgrass control, and Canada thistle suppression in hard red spring wheat and durum. **Do NOT** apply to barley. **DO NOT** apply more than 2 pts/A of Roundup as a harvest aid. Generic brands of glyphosate (Glyphos, Jury, Mirage, Rattler, Ruler, Show-Off, Silhouette) **ARE NOT** labeled as a harvest aid.

Apply with a nonionic surfactant at 0.5% v/v. Ammonium sulfate should be added at 1% to 2% v/v or 8.5 to 17 lbs/100 gallons of water. Ammonium sulfate increases control of annual and perennial weeds and especially weeds stressed by dry weather. Ammonium sulfate also eliminates antagonism from ions and carbonates in hard water. **DO NOT** use ammonium sulfate in place of a nonionic surfactant.

Application should be made after the hard dough stage (30% or less grain moisture) of the wheat and at least 7 days prior to harvest. Roundup can be applied by air or ground. Use a spray volume of 3 to 10 gpa.

DO NOT apply to wheat grown for seed as a reduction in germination or vigor may occur. Be aware of the injury potential of Roundup drift on sensitive plants.

Roundup or Roundup RT can be tank mixed with 2,4-D for additional broadleaf control. A new 2(ee) label interpretation (in North Dakota) has been granted allowing Roundup RT at 0.75 to 2 pt/A + Banvel at 0.25 to 0.5 pt/A for a preharvest application to wheat and durum at the hard dough stage and green color gone from stems. A waiting interval of at least 14 is required before harvest. A surfactant is required and the tankmix can be applied by ground and air application.

Landmaster BW as a Harvest Aid:

Landmaster BW (glyphosate + 2,4-D isooctyl ester) can be applied at 3.38 pt/A (54 fl oz/A) to 5.25 pt/A for annual grass and broadleaf weed control, quackgrass control, and Canada thistle suppression in hard red spring wheat and durum. **Do NOT** apply to barley. **DO NOT** apply more than 5.25 pts/A as a harvest aid.

Apply with a nonionic surfactant at 0.5% v/v. Ammonium sulfate should be added at 1% to 2% v/v or 8.5 to 17 lbs/100 gallons of water. Ammonium sulfate increases control of annual and perennial weeds and especially weeds stressed by dry weather. Ammonium sulfate also eliminates antagonism from ions and carbonates in hard water. **DO NOT** use ammonium sulfate in place of a nonionic surfactant.

Application should be made after the hard dough stage (30% or less grain moisture) of the wheat and at least 7 days prior to harvest.

DO NOT apply to wheat grown for seed as a reduction in germination or vigor may occur. Be aware of the injury potential of Roundup drift on sensitive plants.

Do not feed or allow dairy or meat animals to forage on treated plants for 2 weeks after application. Do not feed treated straw.

Finally, remember that preharvest treatments may not be as effective as you would like them to be. They may not be able to eliminate all harvest problems. Some fields may need to be swathed in order to dry them down enough for harvest.

*Beverly R. Durgan
Extension Weed Scientist, University of Minnesota
Richard Zollinger
Extension Weed Scientist, North Dakota State University*

Soybean Diseases

Septoria Brown Spot has developed in many soybean fields on the lower canopy. Small brown spots on the upper and lower surface of the lowest leaves will run together and form larger areas, the leaf develops a yellow color and drops. In warm wet weather the fungus moves up the plant canopy. Dry weather will slow the development, but I don't expect to see serious losses due to this disease.

The upper canopy of soybeans has two problems: Bacterial Blight and Downy Mildew. The bacterial disease has small angular water soaked spots that become yellow to light brown. The spot dries, becomes reddish brown and has a yellow halo. Young leaves are most

susceptible and can become distorted and yellow. The dead center often falls out and the leaf takes on a ragged look. This disease follows windy rainstorms and seldom is damaging to the crop. Downy Mildew also develops on the upper leaves as a pale green to light yellow spot on the upper leaf surface. Directly below on the lower leaf surface is fungal growth consisting of mycelium and conidia. Infected leaves are seldom killed but the pods can be infected without any symptoms. Seed produced in such pods are small, cracked and covered with a crusty white mycelium. This seed should not be used for planting, but neither of these diseases are considered to reduce yields significantly.

Sclerotinia stem rot or White Mold, as a stem problem is just now being reported. The edible beans have had symptoms for some time while soybeans have only been reported to be infested since 26 July. This is about the same time it was reported in 1994, and if the conditions remain favorable for this disease we can again expect to have yield reductions. The white mycelium was reported in Renville County. Top death follows the development of a lesion on the stem. If you are not looking into the soybean canopy for the stem lesion, the first symptom seen is wilting and death of upper leaves. Growers were reminded the end of June that Elf Atochem has a registration for Topsin M on Soybeans and application of 3/4 to 1 lb/acre at early bloom or R-1 to R-2 growth

stage was possible. The stage of soybean development that I've seen is well past this target. This disease can and I expect will continue to expand in 1995. The excellent soybean canopy development and the length of dew coverage seen where rain was present in the western sections of Minnesota will allow this disease to continue to develop. High plant populations — extensive canopy development or narrow rows may be all that is needed to allow for the development of this disease even in periods of low rain fall. Temperature in the canopy of 75°F is ideal for mycelial growth. This is one to watch, it can and has reduced soybean yields.

*Ward C. Stienstra
Extension Plant Pathologist*

Dryness, Heat, and Corn Yield

Hot weather and dry conditions have many people wondering about the yield potential of this years corn crop. Severe moisture stress is indicated by leaf wilting that is only reversed by additional moisture available to the plant. The number of fields exhibiting this severe moisture stress is minimal, however some do exist. Fields exhibiting this type of stress can lose up to 10% of their yield potential each day during the silking and pollination stage. Likewise, moderately moisture stressed corn combined with high temperatures may experience up to a 5% yield reduction per day during silking and pollination. Sometimes stressed plants will delay silking. This increases the time required for pollination which can result in poor pollination. Some of the early corn is exhibiting some outstanding yield potential, however very hot tempera-

tures can prevent complete pollination even under adequate moisture conditions. Thus, silking and pollination is a very critical time period in corn development.

During the past hot spell several people reported upper leaves on corn turning brown. Some leaves exhibited yellowing, while others went from green to a gray cast before turning brown. Temperatures greater than 100 degrees can scald corn leaf tissue, especially under conditions of moisture stress and hot dry winds. Hybrids vary in their sensitivity to high temperatures. One or two upper leaves lost to this sun scalding will have little affect on yield.

*Bruce Christensen
Extension Educator - Houston County*

Colorado Potato Beetle

Second generation is well underway with some 4th stage larvae already present. Where adult populations do not excessively defoliate plants (< 5% defoliation) growers should not attempt to kill them. This is a situation where selection pressure for resistance can be avoided.

About 40% of the adults beetle we see now will go into winter, as shown by visiting Prof. Dhammika Senanayake.

The reduction in beetle population in the Anoka sand plain area is marked, but by no means absolute, due to

the wide spread use of Admire. The Admire applications at planting have enough reduction in toxic levels in the plant that beetles may now be surviving the dosages presently in the plants.

NuLeaf[®], the new transgenic potato, still appears to be totally protected from adult and larvae feeding.

*Dave Noetzel
Extension Entomologist*

Sunflower Beetle Control

We just completed a large plot trial (10 acres/plot) comparing Furadan 4F soil treatments at plant with early and late Asana applications, and all their combinations.

The fields were planted about the 3rd week in May and were treated for adults on June 20 with 2.9 fl oz/acre

of Asana XL. Larval control was applied on the 15th July using .29 fl oz of Asana XL per acre.

The treatments, larval counts and defoliation readings are summarized in the following table. We will collect yields from this trial.

Treatment	Chemical & formulation	Dosage in lb/ai/acre	Average	
			Larva /10 plants	Percent Defoliation
1)	Furadan 4F	1.0 (at plant)	34.8 a-c	7.8 ab
2)	Furadan 4F +Asana XL .66E	1.0 0.015 (early)	37.0 ab	3.0 bc
3)	Furadan 4F +Asana XL .66E +Asana XL .66E	1.0 0.15 (early) 0.0015 (late)	4.3 c-e	1.5 c
4)	Furadan 4F +Asana XL .66E	1.0 0.0015	1.7 e	5.3 bc
5)	Asana XL .66E	0.015	34.0 b-d	3.0 bc
6)	Asana XL .66E Asana XL .66E	0.015 0.0015	2.2 e	2.2 c
7)	Asana XL .66E	0.0015	2.3 de	4.5 bc
8)	Untreated		66.5 a	11.3 a
LSD (P = 0.05)			31.8	4.85

Dave Noetzel
Extension Entomologist

Dial U

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Large Spiders!

Two of the largest spiders we commonly find in Minnesota are wolf spiders and fishing spiders. We have been receiving a steady stream of calls and samples concerning them. Both are hunting spiders; they do not make webs to capture prey but instead actively hunt for their food.

Fishing spiders can have a body size up to one inch in length with long legs (when their legs are spread out they are almost the size of a 5 year old's hand—my son did the comparison for me). They are generally brown with white markings. Fishing spiders are associated with ponds, streams and other bodies of water.

Wolf spiders can also have bodies up to one inch in size but are generally stockier looking compared to fishing spiders. They are brownish in color and walk or run

along the ground. It is common for these spiders to hide under stones or other debris. When wolf spider young hatch, they climb onto their mother's abdomen where they stay until they are older.

Although either of these two spider may cause concern if found inside, they are easily taken care of. Because they are beneficial due to their insect-eating habits, capturing them and releasing them outdoors is one option. If you would rather not do that, you can kill them with a broom or rolled up newspaper. Also consider that they make good pets when placed in a terrarium. These spiders are not aggressive, but if they are mishandled, they can bite. The bite would not feel any worse than a bee sting. See also FS-1033, *Spiders*.

Jeffrey Hahn
Assistant Extension Entomologist

Heat-Related Garden and Landscape Questions

- ✓ Raspberries ripened with inconsistent color; some drupelets were red, others on the same fruit, white. They weren't diseased, just suffering from sunscald and high temperatures. The fruit is perfectly edible. There's no reason to believe raspberries that develop later will also be affected. It all depends on growing conditions as they ripen.
- ✓ Hosta lilies growing in exposed, sunny locations part of the day developed large clear areas covering about 1/3rd of each leaf at the tip. They simply lost moisture faster than their roots could supply it and were sunburned. Unlike humans, plants are unable to regenerate sunburned tissue. (Another reason to be extra cautious about where you place houseplants when you move them outdoors for the summer.)
- ✓ We are also seeing some rose foliage that has chemical burning from sprays of fungicide or insecticide. To avoid injury, apply pesticides to roses early in the day—maybe even 6 or 6:30 am—so spray can dry before temperatures get very high. After spraying use a long stick or dowel to “shake” the stems a bit to flick off excess droplets of spray material. When spray collects on leaf tips, it tends to burn.... especially when it's hot out.
- ✓ People still want to kill creeping charlie and other weeds in their lawns, but it's not advisable to use herbicides when temperatures are high and lawns are stressed, either from heat or lack of moisture. Grass is much more vulnerable to injury. At this point it's best to hold off killing weeds until early autumn when daytime highs are in the 70's or very low 80's. An exception would be if you're trying to clear an area for re-seeding. You could use glyphosate now to have the soil “clean” and ready for seeding by mid-August.

*Deborah Brown
Extension Horticulturist*

Dodder

A parasitic plant called dodder has been reported in many vegetable and flower beds this summer. It is easily recognized as it has no leaves and resembles a light yellow to orange piece of string winding its way around plants in the garden. Since dodder lacks chlorophyll, it is unable to produce food through photosynthesis as other green plants do and must attach to green plants and derive its nourishment from them. The dodder plant produces small inconspicuous flowers which are prolific seed producers. These seeds have a hard seed coat allowing them to persist in the soil for several years. Interestingly, you can introduce dodder into the garden when planting vegetable and flower seeds as dodder is occasionally mixed in with the flower seed.

Once introduced, dodder is difficult to control. Remove all infected plants along with the dodder plant before the dodder goes to seed. Dispose of all traces of dodder in the garden and on tools and clothing. Repeated cultivation is helpful as it encourages seed to germinate which can then be removed. A pre-emergent herbicide used after the desirable plants are established is somewhat effective in gardens where dodder is an annual problem.

Without a host plant, dodder seedlings only survive a few weeks. By planting species that are not susceptible to attack by dodder, ornamental grasses or corn are a good choice, the weeds will eventually die out. Try not to introduce dodder into the garden. Use only clean soil taken from locations where dodder or other insect and disease problems are not present. Remove infested plants immediately upon discovery and inspect all plants carefully before purchase.

*Cynthia Ash
Assistant Plant Pathologist*

Mole Patrol

Mole damage to yards and gardens can be dangerous, unsightly and frustrating. Moles create “raised” tunnels as they move about underground in search of insects. The most effective control in this case is a mole trap, preferably the harpoon or choker-loop types found in most hardware stores or farm and garden centers. Moles are especially active at night, so concentrate your efforts accordingly. In late afternoon, inspect the yard for what appears to be the most recent damage. Step down on the tunneling in at least three areas. Return 1/2 hour later to see if the tunneling has raised back up. If it has, place the trap in a tunnel in that area. One comforting bit of information: moles are extremely territorial, so the chances of you having more than a few in your yard are slim. One mole however, is capable of an incredible amount of damage.

*Julie Wermerskirchen
Wildlife Technician*

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MN 2000 MCN 1/19

MINNESOTA

Vol. 1
No. 19

CROP

NEWS

From the
Crops System Team
of the
Minnesota Extension Service

CORN

European corn borer

ECB populations continue to provide some "interesting" dilemmas for both field and sweet corn growers. In most of our southeast and south-central regions of the state, ECB moth catch and egg-lay dynamics have been fairly typical of what we would expect with true 2-generation populations; i.e., 2 complete generations during most years, with a possible 3rd flight in above-normal temperature (degree-day) years. In these "typical" populations, we are now at approx. 1,275 degree-days (e.g., Rosemount, as of 7/17/95), which is still just between the 2 "normal" moth flights. For these populations, the 2nd flight should begin by late July, with significant egg-lay occurring by August 5-10th, typical timing for an "average" year.

However, in some areas of the state (e.g., west-central, Glencoe, Hector, Morris), we do not usually see the typical 2-generation dynamics, but more continuous moth flights, or extended flights during a given generation. A specific example of atypical egg-lay was just relayed to me by George Klacan, checking fields in the Glencoe/Hector area this past week. George found that fresh egg masses were still being laid, and that *some sweet corn of all growth stages was still attractive for oviposition — again, this is occurring now when most of our southern Minnesota populations are late-instar larvae or pupae.* In these areas fields should be checked at least twice/week for ECB, before an insecticide treatment is applied. As in previous years, an action threshold of 4-6% of the plants with egg masses and/or young larvae (first-second instars), for late-tassel to first-silk sweet corn, should provide good results for deciding when to apply the first insecticide treatment. Usually 2-3 sprays, at 5-7 day

intervals will provide excellent control of ECB and Corn earworm (pyrethroids only for CEW) during this time. Stop spraying sweet corn within 7 days of harvest; any new larvae hatching within 7 days of harvest will not gain enough size to be a problem at harvest.

Finally, I will offer some reasons why some growers have not had the most desirable success with first-generation (whorl-stage) ECB treatments (sweet corn OR field corn) this year — even with the pyrethroids. For first generation, we have the problem of extended moth flights in some areas with extended egg-lay, or, more likely; distinct "bursts" of egg-lay activity, which eventually results in distinct bursts (or cohorts) of larvae hatching. So, with only one insecticide application during this time interval, we usually will hit **one** of these larval cohorts well (e.g., 2nd-3rd instar) before they are boring into the plant — or young larvae that are feeding in the tassel as it moves up out of the whorl. However, it is also

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Corn - European Corn Borer
Corn Earworm
Alfalfa - Potato Leafhopper
Phosphate Use And Zinc Fertilization
Dry Bean Rust
Corn Stalk Breakage
Dial U
Ants Common This Year
Picking Summer Bouquets
Rats And Mice

For more information contact Extension Plant Pathology at 612-625-6290

Corn/Continued

likely that some larvae will have already bored into the stalk, and are therefore less likely to receive a lethal dose. This phenomenon was evident 2-3 weeks ago when we sampled sweet corn near LeSueur, where some late-instar larvae were present even though most of the worms were 1st-3rd instar. Because of the extended timing and corn growth dynamics, it is difficult to exceed 80-85% control with a single application of any material, even the pyrethroids. My limited data on sweet corn, and numerous studies on field corn, shows that a single application will usually provide only 60-85% control for a variety of materials. Therefore, sweet corn growers (especially those of ECB-susceptible fresh-market hybrids) are justified in many years (like this, with good ECB pressure) to apply 2-3 applications from mid-whorl to tassel to prevent late-instars from tunnelling into newly developing ears.

For field corn, the same rationale applies (to minimize tunneling in the stalk), but it is usually not economically feasible to apply more than one application during the whorl stage (with the possibility of needing a 2nd application for 2nd generation ECB as well). To make this decision, the first-generation worksheet developed by Ken Ostlie (see earlier issues of MCN; or, FS-5969-A fact sheet) should be used and, for example, modified to incorporate the impact of one treatment already applied (e.g., remaining larval infestation and cost of additional control).

Corn earworm

We still have not detected any CEW in our pheromone or blacklight traps at Rosemount.

*Bill Hutchison
Extension Entomologist*

Alfalfa

Potato Leafhopper — PLH infestations have gradually been building over the past 2 weeks throughout southern Minnesota alfalfa. Although many growers are now cutting, or soon will cut, their hay, I have noticed a variety of growth stages, with some alfalfa still 10-14 days away from cutting (e.g., time to first bloom). Fields that are <14 days from cutting should be treated with a labelled insecticide (see *1995 Insecticide Suggestions for Field Crops*, BU-500), rather than allow the damage to build and just cut, or cut early. All labelled insecticides provide good residual control (e.g., nymphs hatching over time from eggs laid in the stems), with the exception of Sevin (carbaryl) or Malathion. These latter 2 materials will provide good knockdown kill of PLH adults and nymphs, but only poor residual control of nymphs, which will continue to hatch from eggs following treatment. For

all other materials labelled (e.g., Pounce, Ambush, Cygon, Lorsban), the middle rate of each will be effective. For those fields that are not treated and only cut, growers should cut as close to the ground as possible, minimizing any remaining stubble for PLH eggs to continue to survive in; **these fields should be checked closely during the regrowth of the 3rd crop as well to be sure PLH thresholds are not exceeded.** With the late arrival of PLH this year, and relatively late buildup of infestations, we could have above-normal pressure on the 3rd crop this year. Again, the thresholds are based on plant height, ranging from 0.5 to 2.0 PLH/sweep (with standard 15" diameter sweep net) for alfalfa that is 6" to >12" tall.

*Bill Hutchison
Extension Entomologist*

Phosphate Use and Zinc Fertilization

Phosphate and zinc are frequently part of the corn fertilization program in many areas of Minnesota. Both nutrients can produce substantial yield increases when needs are indicated by low soil test values. Some have asked if the requirement for zinc increases as the amount of phosphate used increases.

Long-term research in Iowa (1965-1990) shows that use of phosphate does not necessarily increase the need for zinc in a fertilizer program. The results of that research are summarized in the following table.

Starting with a low soil test for phosphorus, there was a response to phosphate fertilization in each year of the study. This increase is shown in the yield. However,

there was no yield increase from the addition of zinc to the fertilizer program. There was no need for zinc when very high rates of phosphate (184 lb./acre) were applied each year. These results provide strong evidence that the need for zinc does not depend on the rate of phosphate applied.

The soil test for zinc works well and is reliable. Use of zinc in any fertilizer program should be based on the results of a soil test rather than the rate of phosphate fertilizer applied. Those who think that a shortage of zinc might be limiting yield should use a soil test to be sure.

*George Rehm
Extension Soil Scientist*

Effect of use of phosphate and zinc on corn yield (1965-1990 Ave).

Zinc Applied	Annual Phosphate Use (lb./acre)			
	0	23	92	184
lb./acre	----- bu./acre -----			
0	99	132	136	141
10	103	133	137	143

Source: Mallarino and Webb, Iowa State University

Dry Bean Rust

As of today, Tilt has been granted a temporary label for the control of rust on dry beans in Minnesota. This temporary label is in force until September 1, 1995. Sprays should be made as soon as rust is seen in an area or field. One or 2 sprays (with a maximum of 3 sprays) can be made on a 14-day schedule depending on the

severity of infection. Do not harvest hay or beans within 28 days of the last application. Research data in Minnesota and North Dakota show this fungicide to be very effective against rust. Rates of 1.8 oz ai/A, or 4 fl oz of product/A is the application rate.

*Richard A. Meronuck
Extension Plant Pathologist*

Corn Stalk Breakage

Corn is at the growth stages when it's common to have some stalk breakage. Breakage can occur at any growth stage, but most frequently occurs when plants are approaching tasseling. Plants are growing rapidly and are brittle; they snap easily with high velocity winds. Stalk brittleness is enhanced by some post-emergence applied herbicides (Banvel and 2,4-D).

Stalk breakage is called green snap, brittle snap, wind breakage, wind injury, etc. There has been some breakage and could be more, depending primarily on wind velocities that might occur in the next two weeks.

What effect does breakage have on grain yield of individual plants and the whole field? If breakage occurs above the primary (uppermost) ear, there should be some grain formed on a broken plant that will contribute to yield. The yield produced on a broken plant will be lower

if the break occurs below the primary ear node. Results from a breakage study conducted at the Southern Experiment Station, Waseca, are given in **Table 1**.

Yield is affected to a greater extent as more plants are broken. In this study, yield was reduced 40% when all plants were broken, or an average yield reduction of 0.4% per plant.

To estimate the effect of breakage on the yield in a field, one can count the number of plants in 100 plants that are broken to arrive at percent plants broken and multiply by 0.4% to estimate percent yield reduction. The location of breakage is also a factor; there will be a greater yield reduction when plants are broken below the uppermost ear.

Dale Hicks
Extension Agronomist - Crops

Table 1. Effect of stalk breakage on grain yield (Southern Experiment Station, Waseca, 1994)

Percent Plants Broken ¹	Grain Yield		Grain Moisture
	Bu/A	%	%
0	168	100	18.3
25	151	90	18.8
50	143	85	18.6
75	117	70	18.4
100	102	60	18.3

¹ 25% broken was one plant broken and three plants not broken

50% broken was every other plant broken

75% broken was three plants broken and one plant not broken

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Ants Common This Year

Household ants, especially cornfield ants, have been commonly found in peoples' home this summer. This seems to be associated with the hot, humid weather we have had this summer. These ants generally are nesting in soil outdoors and are coming inside to forage for food. They are primarily nuisances and do not cause any damage to property.

There are several steps in controlling these ants. First minimize attracting the ants. Be sure food is properly stored and garbage is taken out regularly. Clean any food residue on countertops, tables, and other surfaces. Rinse cans and bottles saved for recycling before storing them. You can disrupt ant trails with a mild solution of vinegar and water. Caulk cracks that ants are using to enter homes.

If necessary, supplement this with an insecticide treatment applied around the foundation of the home. If you know where the ants are coming in, spray just that area. If you're not sure where they are, you may need to treat around the entire house. Spray either chlorpyrifos (Dursban) or diazinon. Be sure it is labelled for outdoor use around buildings.

If you do nothing about the ants, they should go away on their own by the end of the summer (assuming they are nesting outdoors). If not, have them identified so you are sure what species you are dealing with and the best control of them. See FO-1066, *What To Do About Household Ants*.

*Jeffrey Hahn
Assistant Extension Entomologist*

Picking Summer Bouquets

It's easy to enjoy bouquets of fresh flowers this time of year. You probably have the makings growing right in your own yard. If not, farmer's markets — at least the large Twin Cities markets — abound with beautiful blossoms, fresh picked and reasonably priced.

Pick your own flowers early in the morning or at night when they're not moisture-stressed. Be sure to take long stems, even if it means sacrificing a few small, undeveloped buds. (In the case of annuals, more will develop.)

Strip off any foliage that will sit in water, inside the vase, unless it means removing all foliage. Your bouquet will be more attractive if there are a few leaves intermingled among the blooms.

Once you bring the flowers indoors, whether they came from your own garden or the farmer's market, recut the stems. (An angled cut will prevent stems from sitting flat against the bottom of the container.) Put them immediately into slightly warm water that has been mixed with floral preservative.

You can buy floral preservative at garden centers and through mail-order gardening catalogs. If you don't have any, changing the water daily will help the cut flowers last a bit longer, though not as long as they would with the preservative. Old-fashioned nostrums such as dropping aspirin or pennies into the water are of no value.

Another factor in keeping the bouquet lasting longer is starting out with a clean vase. Use a bottle brush with hot soapy water to wash your containers before storing them for later use. If it's impossible to clean them with a brush, drop a foaming denture cleaning tablet into the vase and let it sit overnight to do the job for you.

*Deborah Brown
Extension Horticulturist*

Rats and Mice in the Home

Norway rats and house mice thrive in association with humans. Because these animals have developed a close association with humans and have diverse eating habits, sanitation is the first and most important step to elimination of these critters in the home. If possible, try to find the nesting area. Eliminating the nest is an important step to eradication and may also aid in identifying where these rats/mice are entering your home. Entrance/exit holes may be anywhere on the home, even as high up as the roof. Repair any cracks or holes that could be possible entrance/exit points. Traps, glue boards and rodenticides may be used to eliminate mice/rats and should be placed in areas you know the critter frequents.

*Julie Wermerskirchen
Wildlife Technician*

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CROP**NEWS**

*From the
Crops System Team
of the
Minnesota Extension Service*



The Precision Farming Initiative

Approximately two years ago, several faculty members in the College of Agriculture started to work on a new initiative that would make farming today and in the future more precise. This initiative was given the name of "precision farming." Since that beginning, several research projects and educational programs have focused on the varied aspects and numerous questions associated with this new initiative. Many questions have also been raised. Perhaps a brief explanation of the initiative will help to answer some questions.

There are three important points that need to be made. These are:

- ✓ The broad objective of the initiative focuses on using the correct crop production inputs under the correct conditions at the correct time.
- ✓ The emphases of both research and extension activities is on farm profitability and environmental quality.
- ✓ There is no stated intent to reduce inputs. Instead, inputs will be used more effectively and more efficiently. Total input use for the farm enterprise may either increase or decrease.

There are several management practices that can be used to make farming more precise. Some that have been identified are:

- ✓ Variable rate fertilizer application
- ✓ Use of banded fertilizer instead of broadcast applications

- ✓ Use of banded herbicides when appropriate and in compliance with labeled use.
- ✓ Weed mapping
- ✓ Predicting in-season use of nitrogen fertilizer
- ✓ More precise application of animal manures
- ✓ More precision in soil sampling (grid sampling)
- ✓ On-the-go yield monitors
- ✓ Changing crop varieties to match soil conditions.

There are certainly others that can be added to this list.

There are several active research projects which focus on adding more precision to farming. The results of these projects will be a major part of extension programs in the near future.

*George Rehm
Extension Soil Scientist*

Highlights...July 14, 1995

*The Precision Farming Initiative
White Mold: A Disease Which
Threatens Yield
Dial U
Tomato Disease
Masked Hunters
Mulberry Time*

White Mold: A Disease Which Threatens Yield

Now is the time to be getting your white mold control program in operation for the year. White mold is the most serious yield limiting disease under wet growing conditions.

White mold is caused by a fungus and develops as a white cottony growth on the stem, stem branches and pods of bean plants. The fungus also produces black, hard mats which appear near on the cottony growths. These black structures are the survival structures which allow the organism to survive adverse (winter) conditions.

The disease cycle starts when the leaf canopy covers the row spaces, within and between the row. Germination of the survival structures occurs when soil conditions of near field water holding capacity for 10 to 14 days and temperatures between 59-65 ° F. Upon germination, small mushroom-like bodies appear on the soil surface. Spores are produced by these mushroom-like structures which infect wilted flowers or other dead plant tissue, later spreading to living plant tissue.

Infection kills some plants and severely reduces the yield of plants with pod infections. High humidity and plant canopy temperatures between 68 and 78 ° F favor the spread of white mold.

Fungicides are effective in controlling this disease, and timing is important for the most efficient control. Benlate, Topsin M and Rovral are labeled for control on dry beans. It is important to follow label directions for the best control. Our research shows that a single banded application or 2 broadcast applications are effective.

Our research at Staples, MN has concentrated on collecting data for incorporation into a model system for use as a management guide for fungicide applications. The data collected over the last 5 years has revealed a high correlation between the amount of rainfall 10 days before bloom to 10 days after bloom to final disease. This gives us information on whether or not we should spray. Sprays need to be made before the disease develops for best control.

If the crop has a full canopy, contains apothecia and has accumulated more than 2.5 inches of rain, the model strongly suggests a spray. So far the model is developed for vine type pintos although last year the model accurately predicted a needed spray when used on Othello pinto.

The pinto bean model did not accurately predict a spray program in kidney beans. Kidney beans seem to be able to tolerate more rainfall during the critical bloom period. Alternative inputs for kidney beans will need to be determined.

White mold seems to be the most serious in dry beans grown under a pivot. Our data indicate that irrigation's should not be applied until the water tension is 55-65 CB (an average of readings at 4 and 10 inches). During years when the weather was conducive for white mold, following this irrigation schedule, without spraying, was just as good as 2 sprays of fungicide on plots which were kept very wet.

Crop rotation using the right crops will help prevent the build up of inoculum. A rotation of three to four years between susceptible crops is necessary to accomplish this. Sunflower, potato, canola, mustard, and soybeans should not be grown in close rotation with edible beans because they are susceptible. Small grain and corn are recommended in a rotation with edible beans because they are not susceptible. Sclerotia from a previous bean crop will germinate in a small grain canopy and can serve as a source of spores for nearby bean fields. Nevertheless small grain is a good rotation crop as it rids the soil of many sclerotia through germination. The small grain crop is not affected by these fungus spores. Small grain fields should be planted downwind (the prevailing wind) from bean fields. This could help prevent some spores from reaching the bean fields. The use of bean varieties with an upright growth habit in wide rows and the use of recommended fertility and seeding rates will also alleviate the disease pressure.

*Richard A. Meronuck
Extension Plant Pathologist*

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Tomato Diseases

Tomato leaf spot diseases are just beginning in many gardens around the state. Check the lower leaves for pin-head sized spots with dark centers and light margins. These spots, caused by the *Septoria* fungus, cause the leaves to yellow and shrivel up on the vine starting at the base of the plant and working up. Early blight, caused by the *Alternaria* fungus, causes larger lesions which tend to increase in size over time and take on a target appearance. Early blight also starts on the lower leaves and works up. Damage from both leaf spots can be minimized by watering only at the base of plants, infrequently and early in the day; by staking; by allowing for adequate spacing between plants at planting time; by removing all weeds from the garden regularly and by rotating tomatoes to a new site in the garden each year. Tomato plants should be monitored regularly, and at first sign of disease the infected leaves should be removed and a spray application of chlorothalonil (Daconil 2787), or other registered fungicide, applied regularly according to label directions.

Also Watch For...

... rust on roses, rust on turf, more powdery mildews, slime molds and aster yellows.

*Cynthia Ash
Assistant Plant Pathologist*

Masked Hunters

We received our first masked hunter sample recently. Adults are about one inch long and black. Immature masked hunters cover themselves with dust and lint as a type of camouflage (hence their name). They appear whitish or grayish because of these materials but are actually dark colored underneath.

Masked hunters are usually not aggressive toward people but can bite people with their needle-like mouthparts if handled. These assassin bugs prefer to eat other insects, especially bat bed bugs. Typically, no more than a few masked hunters are seen indoors; physical removal is the only necessary control. If large numbers are found, look for a food source, such as bat bed bugs. Eliminate the food source to control masked hunters.

*Jeffrey Hahn
Assistant Extension Entomologist*

Mulberry Time

Dial U starts receiving mulberry questions about this time each year. Questions include identification, edibility, winter injury and failure to produce fruit.

Fruits from both red and white mulberry trees look something like elongated raspberries. They're definitely **edible**, but birds often get them before they ripen fully. Fruit of the red mulberry is reddish-black when ripe; fruit of the white mulberry remains white, and has a flavor often described as "insipid." Birds spread mulberry seeds in their droppings; they're often considered "weeds" in alleyways and on untended property.

Not all mulberry trees will bear fruit. Mulberries are a good example of **dioecious** plants; some trees have only male flowers while others have only female flowers. It's the "female" trees that produce fruit, but only if there's a "male" around to provide the pollen.

Mulberry trees are easy to **identify** because they have such unusual leaves. Some are slightly heart or spade-shaped while others on the same tree, even the same branch, may have several lobes. The lobed leaves are asymmetrical, often with two lobes on one side of the mid-vein and several lobes on the other.

The trees are small here, rarely over twenty feet tall. White mulberry is very **marginally hardy** and suffers considerable dieback when winters are severe. Red mulberry is only a little better and is found growing primarily in the southern third of the state.

Though mulberries are wonderful in a naturalized area where you want to attract and feed wildlife, they're less than ideal in a more manicured landscape due to their messy fruit, the likelihood they'll pop up as weeds and their unpredictable longevity.

*Deborah Brown
Extension Horticulturist*

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CROP

From the
Crops System Team
of the
Minnesota Extension Service

JUL 10 1995

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Sweet Corn

European corn borer (ECB)

The first generation moth flight rapidly diminished to 5 moths/night at most locations in southern Minnesota during the past week, indicating that the first generation flight is nearly over. Several early-planted fields, however, have whorl infestations ranging from 10-50% with shot-holing damage. Although many of these plants have live larvae, there are still many early instars (1st, 2nd and 3rds), indicating treatment is still possible (see also articles by Ken Ostlie for more details about whorl stage treatments, and the *1995 Commercial Vegetable Guide* for labelled insecticides See also the attached information for the new label for Warrior 1E pyrethroid for sweet corn).

Our recent ECB action threshold studies (Ph.D. student David Bartels) indicate that most **fresh-market sweet corn**, regardless of growth stage (whorl through early silk) should be treated when 5% of the plants are infested with live larvae. However, we have also confirmed that most of the **processing hybrids** (e.g., Jubilee, or Green Giant Code 40) can tolerate more ECB damage in the whorl and tasseling stages. With 2 years of data, I would not treat whorl stage corn (for processing) unless a field averages 25% with live larvae (this is much higher than the traditional 10-15% threshold often recommended in the midwest). (**Note:** because of variable weather during the 2 years of study, we are collecting more data this year for the same varieties before developing final recommendations). For late-tassel to silking sweet corn, I would still use a threshold of 4-5% of the plants with egg masses and/or live larvae (for ECB and/or corn earworm).

Regarding **corn earworm (CEW)**, we have not yet detected moths in our pheromone traps at Rosemount. During the past 5 years, CEW flights have not been significant until about August 24th (± 4 days) in southern Minnesota, thus having a primary effect on late-planted or late-maturing hybrids.

Bill Hutchison
Extension Entomologist

Highlights...July 7, 1995

Sweet Corn — European Corn Borer
New Insecticide Registrations for Vegetable Crops
Colorado Potato Beetle
Sunflower Beetle (SB) Larval Control
Label For Warrior (nee Karate)
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New Insecticide Registrations for Vegetable Crops

During the past 3 weeks two pyrethroid insecticides have received registrations for a variety of vegetable crops, specifically **Baythroid 2E (cyfluthrin)** (by Miles) and **Warrior 1E (lambda-cyhalothrin)** (by Zeneca Ag Products). **Both are restricted use pesticides, primarily because of their toxicity to fish and aquatic organisms, and may therefore be applied only by certified applicators, and have the usual minimum distance requirements for fields near waterways (e.g., 25 ft. by ground and 150 ft by air).** *NOTE: Baythroid is labelled for GROUND APPLICATION ONLY.* All users of these new products should consult the myriad of details on the labels. Each product represents the most recent generation of pyrethroid development, providing excellent control of a variety of insect pests at very low rates of active ingredient/ac. As with other pyrethroids, misuse or over-use of the same product can lead to resistance problems and/or aphid outbreaks — these products are also quite active on most of our beneficial insects. With these caveats, I have summarized the labelled rates for **selected** key pests and crops.

Baythroid 2E (Ground Application ONLY)

Crop	Pests	Rates	PHI*
Carrots	Aster Leafhopper	1.6-2.8 fl oz/ac	7 days
Peppers	European corn borer Corn earworm Potato leafhopper	1.6-2.8 oz/ac	7 days
	Cabbage looper Thrips	2.8 oz/ac	
Radishes	Flea beetles Cutworms	1.6-2.8 oz/ac	0 days
Tomatoes	Tomato fruitworm Europ. corn borer Colorado Pot. Beetle Potato aphid Tomato hornworm	1.6-2.8 oz/ac	0 days

Warrior 1E (Ground OR Aerial Application)

Crop	Pests	Rates	PHI*
Sweet Corn	E. Corn Borer Corn earworm Cutworms Common Stalk borer Sap Beetle Adults Flea beetle Tarnished Plant bug Aphids (suppression only; may facilitate outbreaks)	2.56-3.84 fl oz/ac	1 day
Cabbage, Broccoli, Lettuce	Cabbage looper Flea beetle	2.56-3.84	1 day
	Imp. Cabbageworm Diamondback moth Cutworms	1.92-3.20	
Onions (Bulb, & Garlic)	Onion thrips Cutworms	2.58-3.84	14 days
Tomatoes	E. corn borer Col. Pot. beetle Cabbage looper Plant bugs Stink bugs	2.58-3.84	5 days

* PHI = pre-harvest interval.

Again, for details, please review the label carefully; complete details will also be included in the *1996 Commercial Vegetable Production Guide*. New Warrior labels are also in place for field corn, seed corn, popcorn, soybeans, and sunflower.

Bill Hutchison
Extension Entomologist

Colorado Potato Beetle - (CPB)

In the Central sands (ie from Hastings through Clear Lake, MN) 4th stage larvae in untreated fields are beginning to pupate. Overwintering adult numbers have dropped dramatically in both Admire treated fields and in other locations. Admire treated fields and NuLeaf® transgenic potato are, to date, free of both adult and larval defoliation by the first generation of CPB.

We have examined fields treated with Provado (identical active ingredient as in Admire) in the central sands area and have been impressed with its outstanding control of these highly resistant CP beetles. It's also evident that the product as a foliar has rather limited persistence

on the leaf. However, the lack of persistence, or residual, is highly desirable for good resistance management.

The efficacy of Provado, Admire and Nuleaf® (transgenic) potatoes against CPB adults and larvae is little short of phenomenal. It reminds one of the introduction of Pydrin in the early 80's. The opposite side of the coin of high efficacy is the potential for rapid development of insecticide resistance to these products. I can't imagine how we can avoid resistance development if any of these area used exclusively for 2 or 3 seasons.

*Dave Noetzel
Extension Entomologist*

Sunflower Beetle (SB) Larval Control

Fields which had large numbers of adult sunflower beetles earlier and/or moderate to severe adult defoliation are likely going to have to be examined for SB larvae this week. If larval numbers exceed 15/plant use Asana XL or Warrior (Karate) for larval control. Asana will give complete larval control with 1/3 fluid oz per acre and

Warrior will do the same with 1/5 fluid oz of product per acre. There is just no justification, economic or otherwise, for using any more insecticide than this, nor for treating any field that has less than 15 larvae/plant.

*Dave Noetzel
Extension Entomologist*

Label for Warrior (nee Karate)

Finally we received notification from Zeneca that Warrior (Karate), a pyrethroid, has received label for wheat, sorghum, sunflower and a number of vegetables. I have compared Warrior with a huge array of products for seed insect control in sunflower for nearly 20 years. It is clearly superior to Asana XL for seed weevil and banded sunflower moth control and is as safe as Asana XL to mammals. It will be highly competitive in efficacy with ethyl-methyl parathion although slightly more costly

price-wise. It has excellent activity against armyworms and cutworms and has most limitations similar to other pyrethroids (eg very tough on aquatic organisms).

Those growers that encounter seed insect problems sunflower this growing season should treat a few acres with Warrior just to become acquainted with the product and its performance.

*Dave Noetzel
Extension Entomologist*

European Corn Borer

Last week I discussed the situation in southern Minnesota. Infestations are aging rapidly and most infestations are now past the point of optimal insecticide performance. A relevant question at this point is "When is it too late?" The answer depends on what the larvae are doing. Check both larval stage and infestation location on the plant. In your assessment of whether or not to treat a field, count only larvae feeding in the whorl and upper leaf axis. Third stage larvae began tunneling through the whorl and into leaf midribs. These larvae can still be controlled with insecticide but should tip you off that tunneling is imminent. Older larvae also tend to move out of the whorl and occupy lower, more protected sites on the plant. This behavior is a precursor to actually tunneling into the plant at lower leaf axis. Tunneling behavior begins in earnest

during the fourth stage and insecticide performance drops drastically.

Dropping moth captures in black light traps in central Minnesota indicate that moth activity and egg laying probably peaked in late June with larval hatch peaking this past week. Heavy rainfall in some WC areas (>3") probably suppressed corn borer infestations so re-check fields targeted for insecticide application if the rain hit before insecticides were applied.

Cooler, wet weather suppressed moth activity in NW Minnesota, but moth emergence and egg laying is underway.

Ken Ostlie
Extension Entomologist

Dial U

Dial U is a user-fee telephone diagnostic clinic for calls and samples related to gardening, landscapes, plant diseases, insects and wildlife associated with the home environment. Calls from the public are taken at 1-900-988-0500 weekdays. A flat \$2.99 charge is billed automatically to the phone from which the call is placed.

Slime Molds

Slime molds are interesting single celled organisms which aggregate to form large masses which catch our attention. Although there are hundreds of species of slime molds, one is particularly common, appearing in home landscapes where organic matter in the form of wood chips or compost is common. This slime mold is foamy yellow at first and changes location as it grows 8 to 10 inches across. As the slime mold matures it becomes a crusty brown blob. All of this happens over a period of several days.

Slime molds are not parasitic on plants or animals and should just be enjoyed as one of Mother Nature's creations. Where they cannot be tolerated they may be dispersed with a strong stream of water or physically lifted from the site and disposed of.

Cynthia Ash
Assistant Plant Pathologist

Entomology Notes

Carpenter ants remain our most abundant question. We are also getting calls about fourlined plant bugs, Colorado potato beetles, maple bladder galls and other galls, yellowheaded spruce sawflies, and mountain ash sawflies. We are just starting to get questions about home-invading weevils, such as strawberry root weevils. These insects are temporary nuisances that are best controlled by physical removal. We have received our first earwig sample. This insect is beetle-like with a set of pincers on the tip of the abdomen. Although they have the potential to be garden pests, people normally report them as nuisances or curiosities.

We have also received a few northern fowl mite samples. If a bird nest is abandoned or a bird falls out of a nest, these very small mites can enter homes looking for food (i.e. blood meals from birds). They may bite people in this quest but fortunately do not reproduce on human blood. Wipe up or vacuum mites that are found indoors. You can spray chlorpyrifos outside around windows to prevent more mites from entering (do not spray if you may harm birds).

Jeffrey Hahn
Assistant Extension Entomologist

It's Not Too Late to Add Plants to Landscape

The idea of spring planting is well-entrenched in the minds of most Minnesotans. And at one time, spring was clearly the best time to add most plants to the landscape. Now, however, we have much more latitude; it's certainly not too late to plant. And you can often save money this time of year, as garden centers and nurseries reduce their prices after the spring rush.

Balled-and-burlapped trees and shrubs, shrubs growing in large containers, and flowering perennials can be planted virtually any time during the growing season, though it's still best to try to find a reasonably mild day rather than planting in hot, scorching weather. Trees can also be moved successfully with tree spades, provided a large enough spade is used.

Many garden centers still have packs of annuals and herbs for sale. If they seem a bit spindly and overgrown, don't be afraid to pinch them back, especially if you have

a nice sunny location for them. Work fertilizer into the soil before planting and you'll find they'll grow rapidly and soon add color (and flavor) to the garden.

In summer it's especially important to water new additions to your landscape thoroughly, but don't make the mistake of killing them with kindness. We get calls at Dial U all summer long from people who water new trees and shrubs daily, then wonder why the leaves turn yellow and branches die.

In all but the hottest weather, a weekly soaking is usually adequate -- unless your soil is very sandy, in which case you may need to water every three or four days. Take rainfall into account when you decide whether to water. If soil is damp, wait.

*Deborah Brown
Extension Horticulturist*

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Crop Injury Risk at High Temperatures with Soybean Postemergence Herbicides

High temperatures and humidity from the last 10 days have increased the risk of crop injury with the application of systemic ALS herbicides to soybean. Soybean herbicides that fall under the amino acid synthesis inhibitor mode of action (ALS enzyme inhibitors) can have increased crop injury potential when applied at temperatures above 90°F and 70% relative humidity. With temperatures above 90°F, it is possible that crop injury symptoms could be visible in 3 to 5 days. The crop injury symptoms most likely to occur with these systemics are yellowing of leaves, stunting and slow plant growth, and in a severe case, death of the growing point. If hot, dry weather continues, soybean plants will be doubly stressed from the weather and crop injury they sustained from these types of herbicides. Recovery will be very slow.

Soybean herbicides such as Pursuit, Scepter, Pinnacle, and Classic all have the same mode of action — that is, amino acid synthesis inhibitor. Systemic herbicides such as these can put more stress on soybean plants when applied in hot, humid conditions. Contact herbicides also can cause crop injury when applied under similar conditions. However, the crop injury associated with contact herbicides will be less and shorter-lived than systemic herbicides when applied under these environmental conditions.

Contact herbicides such as Basagran, Blazer, Cobra, Reflex, and Resource can all cause crop injury in hot humid conditions when used with a crop oil. In most situations, this bronzing of leaves is temporary and plants recover. It is especially important to read the label care-

fully so as to select the proper mix of surfactant, crop oil and liquid fertilizer to obtain the best possible weed control. Misuse of these additives can lead to serious crop injury. For example, the addition of oil concentrate to Blazer or Cobra increases the potential for soybean injury. Liquid fertilizers can be added to Basagran plus Blazer tank mixtures and to Basagran by itself for improving velvetleaf control. However, the addition of liquid fertilizer will reduce lambsquarters control. If lambsquarters is present in addition to velvetleaf, then crop oil concentrate and liquid fertilizer can be added to

Highlights...June 30, 1995

*Crop Injury Risk at High Temperatures With
Soybean Postemergence Herbicides*
Insect Pests of Southeast Minnesota
Nutrient Report Card For Corn
Soybean White Mold
Soybean Damping-Off
Plant Disease Clinic Report
Late Herbicide Applications on Small Grains
*Corn Borer—Watershed Point for Corn Borer
in Southern Minnesota*
Dial U
Rose Black Spot
Herbicide Injury to Landscape Plants
Colorado Potato Beetles
Entomology Notes

Crop Injury/Continued

Basagran. **DO NOT** mix oil concentrate and liquid fertilizer in Basagran+Blazer (includes Storm and Galaxy) tank mixtures as severe crop injury will occur.

The one weed problem soybean growers are trying to tackle presently is controlling 3 to 4-inch common lambsquarters. Many growers have had good success in controlling common lambsquarter with the addition of Pinnacle to their tank mixture or other broadleaf herbicide. However, given the current weather conditions, the addition of Pinnacle or Classic to broadleaf herbicides could lead to serious crop injury. It specifically states on these product labels that the use of these products during hot, humid weather can increase the risk of crop injury. The most severe plant injury would be death of the growing point and delaying growth which could lead to more problems later in the season.

With the present warm, humid conditions, it is probably safest to opt for a contact herbicide with the appropriate surfactant, crop oil, and liquid fertilizer to increase weed control. Follow-up applications and/cultivation, if applicable, will likely have to be used as part of the weed control program. The use of contact herbicides will have some activity against one inch common lambsquarters, but taller ones will not be controlled very well.

Applicators should use caution in hot, humid weather when making corn postemergence herbicide applications that contain dicamba or 2,4-D. These growth regulator herbicides are easily volatilized in hot weather when temperatures exceed 85°. Herbicide volatilization can occur even days after application. Drift potential is very high under windy conditions. Spray drift can be minimized by reducing sprayer pressure, increasing water volumes with larger nozzles, and using drop nozzles to keep spray release as low as possible to the ground.

*Kevin Cavanaugh
IPM Specialist, Morris*

Insect Pests of Southeast MN

Potato leafhopper (PLH) and Plant bug populations in alfalfa are beginning to exceed threshold levels throughout the Southeastern part of the state. With the very dry, hot conditions of recent weeks and these very high populations of sucking insects, some fields are showing stress symptoms. One field of twelve inch alfalfa had sweepnet counts of 2.5 potato leafhoppers and 3.5 plant bugs per sweep. Control recommendations and threshold limits

are in publication BU-0500, *Insecticide Suggestions to Control Insect Pests of Field Crops in 1995*.

European Corn Borer feeding is evident in some fields, with as high as 70% of the plants showing injury and one larva per plant. The window of opportunity for treatment is still open.

*Bruce Christensen
Extension Educator - Houston Co.*

Nutrient Report Card for Corn

Several trips across Minnesota, during the past 10 days, have provided a good opportunity to assess the nutrient status of corn in 1995. The observations are summarized below.

Nitrogen: There's less nitrogen deficient corn than might be expected. Farmers were usually actively sidedressing N in those fields that were showing some deficiency.

Sulfur: Sulfur deficiency showed up early where soils were sandy. In many fields, these symptoms disappeared as temperatures warmed. This should be a reminder that sulfur should be applied in a starter when soils are sandy.

Zinc: Some zinc deficient corn was evident on areas in fields where topsoil was lost in erosion. There is also some zinc deficient corn on very sandy soils. This is a reminder to use the soil test for zinc when a deficiency or need is suspected. This test is a very good predictor of zinc needs.

Overall, the crop looks good with no major fertility problems over a wide area.

*George Rehm
Extension Soil Scientist*

Soybean White Mold

After this past week, hot and dry and the expectation of more of the same weather, the outlook for Sclerotinia White Mold does not look favorable. Presently the soil temperature and moisture conditions are not suitable for sclerotia germination. This can change if the weather cools and moisture returns. Those who may want to consider a fungicide application to soybeans should know that recently Elf Atochem did receive a Section 2 (ee) registration for Topsin M for use on soybeans to control Sclerotinia. A single application of 3/4 to 1 lb/acre at

early bloom or R-1 to R-2 growth stage on sites with a history of Sclerotinia is advised if conditions are favorable for disease development. Do not graze or feed treated vines or hay to livestock and consult the label for other directions, restrictions and precautions. This registration does not expire until 31 December 1996, which is good because that is when I expect soybeans to be rotated back onto the problem fields of 1994 and 1992.

Ward C. Stienstra
Extension Plant Pathologist

Soybean Damping-Off

Seedling death in soybeans this season is reported to be serious, especially in low areas with high residue. Replanting is being done so stand loss is significant. Seed and seedling rot by water molds, i.e., Pythium and Phytophthora can kill the seed and seedling root before emergence. If Pythium is involved, the plant tissue is usually soft and mushy and the tissue is brown and wet. However the tissue quickly dries out and little plant tissue is left to look at. The dried dead tissue resembles a thin brown string attached to the seed cotyledons. If the damage develops later, post emergence—the leaves wilt and turn grey-green and finally brown. These plants are easily pulled from the soil as the root is totally rotted. This problem is associated with cool wet soils, on the other hand plants that emerged, wilt and die can be killed by Rhizoctonia also. The plants that wilt and die as the weather warms often have a lesion on the stem just below the soil line. This stem decay is localized and brown to red in color. The color fades on exposure to air, so

look for this as soon as the plants are dug. Roots below the lesion are not infected and the infected portion remains firm and dry. The pattern for this disease is those areas that remain wet longer—lower sites and areas under residue that can increase the moisture level. The loss of plants is related to moisture stress, usually killing plants early but older plants can die later under additional moisture stress. The Rhizoctonia fungus is favored by cool weather early and then warm weather like we experienced last week. The fungus survives in residue and when conditions are favorable you may notice greater damage in high residue locations.

Lesions on the stem just below the soil line indicate Rhizoctonia, while extensive tissue decay is most often due to water molds like Pythium. Seedling soybeans do decay rapidly so observations must be made quickly. Soil cultivation can assist root development, ridge soil carefully around young plants to promote new root growth.

Ward Stienstra
Extension Plant Pathologist

Plant Disease Clinic Report

Samples submitted to the clinic in June included:

soybean—*Rhizoctonia* sp and *Fusarium* sp root rot
soybean cyst nematode

wheat—*Bipolaris* sp seedling blight
scab (on stored wheat)

tomato—Tomato spotted wilt virus
Alternaria sp leaf spot (early blight)

pepper—no disease observed

crabapple—fire blight

oak—oak wilt

maple—anthracnose and *Verticillium* wilt

cyclamen—no disease observed

gloxinia—Impatiens necrotic spot virus (INSV)

N.G. impatiens—INSV, *Pythium* sp root rot

begonia—powdery mildew

rose—*Diplocarpon* sp (black spot)

Exacum—*Botrytis* sp stem rot

silage & corn feed—storage molds

raspberry—*Pratylenchus* sp (lesion) nematode

Sandra Gould
Plant Disease Clinic

Late Herbicide Applications on Small Grains

Recent weather conditions have delayed herbicide applications on some small grain fields. Consequently, I have been receiving a lot of questions on weed control in these fields and the use of late herbicide applications on small grains.

Broadleaf herbicides should not be applied to small grains during the boot to early heading stage. Herbicides applied at this time can cause poor seed set or worse —

sterile heads. Herbicides applied at this stage can also cause twisting of the flag leaf, which can prevent the head from emerging from the flag sheath.

Low weed populations or late emerging weeds will not cause much yield loss under wet conditions, therefore applying a herbicide at a late stage can cause more damage than the weed competition.

Other factors to consider with late herbicide applications:

1. Many broadleaf herbicides will not control large weeds, therefore it is not worth risking crop injury for inadequate weed control.
2. There is no way to control large foxtail (pigeongrass) in small grains at or after heading. **DO NOT** waste your money. Paraquat is **NOT** an option. Not only is it illegal, it will not be effective.
3. Buctril or Bronate can be applied up until the boot stage, however, Buctril or Bronate are not very effective on large weeds.
4. Express can be applied up until the flag leaf if visible, however, Express is not very effective on large weeds. Also, if Express is tank mixed with MCPA or 2,4-D it must be applied before the early boot stage.
5. **DO NOT** apply Banvel or Banvel combinations after the 4-leaf stage, as the chances of injury is very high.

The following table is a list of some of the broadleaf herbicides used in Minnesota, and the small grains stage limitations listed on the label.

<u>Herbicide</u>	<u>Small Grain Growth Stage</u>
Buctril	Apply to wheat, barley or oat from emergence to boot stage.
Bronate	Apply to wheat, barley or oat from emergence to boot stage.
Banvel	Apply to wheat before the 4-leaf stage. Apply to barley before the 3-leaf stage.
Curtail	Apply to wheat or barley from tillering to jointing stage.
Express	Apply to wheat or barley from 2-leaf stage, but before flag leaf is visible. DO NOT harvest for at least 45 days.
Harmony Extra	Apply to wheat or barley from the 2-leaf stage until jointing.
MCPA	Apply before boot stage. Varies with herbicide brand. Check the label.
2,4-D	Apply after tillering and before boot stage. Varies with herbicide brand. Check the label.

Preharvest Weed Control:

If broadleaf weeds are going to interfere with harvest, 2,4-D can be applied at 0.5 to 1.5 lbs/A (1 to 3 pts/A of a 4 lb/gal a.i. product) at the dough stage. An ester formulation will give better control than an amine formulation. If using an amine, at least 2 pts/A is needed for larger weeds. Do not expect good control on large pigweed or kochia.

Glyphosate (Roundup) is labeled as a harvest aid in hard red spring wheat only. Do Not apply to barley or

durum. Roundup can be applied with 2,4-D for better control of large weeds, such as kochia. Apply with a nonionic surfactant at 0.5% v/v. Applications should be made after the hard dough stage of the wheat and at least 7 days prior to harvest. **DO NOT** apply to wheat grown for seed as a reduction in germination or vigor may occur.

Beverly R. Durgan
Extension Weed Scientist

European Corn Borer

WATERSHED POINT FOR CORN BORER IN SOUTHERN MINNESOTA—Each year around the 1st of July we reach a watershed point of insecticide treatments for corn borer infestations. Hot weather in early June has made up for earlier cool weather. With populations in SE Minnesota slightly ahead of the rest of the state “see accumulative heat units.”

Corn borer flights seem to have peaked about a week ago in SE Minnesota, with egg laying declining. A dilution effect seems to be working with few fields reaching economic treatment levels. 30 to 60% shotholing is common in early planted fields.

In south central and southwestern Minnesota the cooler, wetter weather has slightly delayed development with the moth flight peaking early this week. Moths are common although egg laying should begin declining.

Many early planted fields are at marginal treatment levels with a few fields at 80-90% shotholing, and 2-3 borers per plant. Use a calculated threshold to tailor the decision to each field situation. Given the variation in yield potential and crop price, some of these fields may be worth treating. If larvae are small, “primarily 1st-2nd stage,” and moths or egg masses are still present, then it would be wise to scout the field again in 3-4 days. The overall treatment strategy is to delay insecticide application until most larvae are 2nd stage. See the June 23 issue, page 104, for diagram of larval stages.

The reasons for delaying application are two-fold. First, young larvae suffer high mortality, typically 70-90%. Waiting will give you a better idea of actual larval survival. Second, the young larvae congregate in the

whorl. Delaying application will insure that newly laid eggs will hatch while sufficient insecticide residue is still present. The only draw back is waiting too long. As the population ages, more larvae move out of the whorls to less exposed sites and the treatment window narrows. Keep abreast of local application situations and allow enough lead time for arranging application.

As a final tip, **DON'T** treat marginal situations. We need to create a positive situation for farmers as they manage european corn borer. Make sure the treatment benefits will be clear cut.

Heat Unit Accumulations for Corn and European Corn Borer through June 26

Location	Heat Units (Base 50°F)
Alexandria	755
Calendonia	797
Faribault	763
Hutchinson	796
LaCrosseq	989
Mankato	820
Montevideo	763
Morris	771
Rosemount	817
St. Cloud	740
St. Paul	855
Waseca	843
Winnebago	777

*Ken Ostlie
Extension Entomologist*

Black Light Trap Captures of European Corn Borer Moths June 20-26, 1995

District	Location	Average captures (#/night)	Peak capture	
			#/night	Date
SE	Rosemount	A 9.3	22	June 21
		B 68.6	12	June 21
	Randolph	6.6	13	June 25
	Simpson	16.0	22	June 23
SC	Blue Earth	A 45.8	77	June 21
		B 101.3	134	June 21-22
	LeSueur	C 11.4	20	June 20
	Sleepy Eye	A 16.0	26	June 25
		B 20.3	28	June 25
	St. Peter	6.6	32	June 26
Waseca	11.7	33	June 21	
SW	Jeffers	25.0	43	June 24
WC	Fergus Falls	4.5	11	June 24
	Morris	40.6	64	June 21
C	Olivia	24.9	66	June 26

Data supplied by Minnesota Department of Agriculture-Plant Division, From industry, University of Minnesota and MDA cooperators.

Dial U

Dial U is a user-fee telephone diagnostic clinic for calls and samples related to gardening, landscapes, plant diseases, insects and wildlife associated with the home environment. Calls from the public are taken at 1-900-988-0500 weekdays. A flat \$2.99 charge is billed automatically to the phone from which the call is placed.

Rose Black Spot

Warm wet weather will bring on one of the most common rose diseases, rose black spot. Black fibrous looking spots about 1/16 to 1/2 inch in diameter appear on the leaves following extended periods of wet weather or irrigation. Infected leaves yellow and drop. This makes the plant look bad and robs it of the leaves needed to produce energy for plant growth and flower production.

Disease control is best achieved by using fungicides in conjunction with cultural controls. Remove and destroy infected leaves as soon as noticed. Avoid conditions which would allow rose foliage to remain wet for long periods of time—crowding of plants, shady areas, overhead watering and watering late in the day. Monitor roses and apply a fungicide labeled for roses as soon as the disease is noticed. Many effective fungicides are available.

Cynthia Ash
Assistant Plant Pathologist

Herbicide Injury to Landscape Plants

Strangely enough, herbicide injury to landscape plants seems to affect urban, suburban, and rural homesites alike. Fumes may drift from neighboring farm fields or a neighbor's yard, particularly if the herbicide is applied on a hot or breezy day.

If you're the culprit, and you suspect or know you accidentally got some weed-killer where you don't want it, get the hose out immediately and wash down the affected plants. The sooner you can wash it off, the less damage will occur.

Even if you're extremely cautious about when you spray, a little gust of wind can carry fine droplets or vaporized material onto desirable plants. If you use a weed and feed product that contains Trimec (a combination of 2,4-D, MCPP and dicamba), the dicamba that washes into your soil can be picked up by feeder roots of trees and shrubs.

Dial U gets a number of calls and samples from people accusing neighbors or their lawn services of carelessness or deliberate vandalism. We have no facilities for checking on the presence of herbicide in samples (you'd need a costly, private testing lab for that service), but CAN do a visual examination of the samples.

Common symptoms of phenoxy herbicide injury (2,4-D or Trimec) include cupping, twisting or curling foliage—particularly the youngest, "softest" growth—accentuated heavy venation, and distorted leaves that may be fan-shaped or abnormally strap-like.

Depending on how much damage is done, plants—especially woody trees and shrubs—may "grow out" of the symptoms. Herbaceous, non-woody plants may or may not improve as the season progresses.

Deborah Brown
Extension Horticulturist

Colorado Potato Beetles

We have received calls from many counties asking what people can do to control Colorado potato beetles in the home garden. Unfortunately there are not many options. You can try handpicking but this can be quite labor intensive. The traditional insecticide choice is carbaryl (Sevin) but most beetles in the state (especially if they are near commercial potato fields) are resistant to it. Rotenone is another possibility, although the beetles could also be resistant to it. A biological insecticide option is *Bacillus thuringiensis* var. *tenebrionis* (M-One). This insecticide is only effective when it is applied against newly emerged larvae. This would require careful monitoring of egg cases. M-One is not effective against older larvae and adults. M-One is available to home dwellers through gardening catalogs. If areas are warm enough, we may see a second generation in July. If not they will enter a reproductive diapause and not lay eggs until next year.

Entomology Notes

Carpenter ants remain our number one question, although we are experiencing an average number of calls overall. There have been a lot of **household ant** questions, such as cornfield ants and pavement ants, that corresponded with the hot, humid weather we experienced. These ants are usually just temporary problems and should go away on their own (see FO-1066, *What To Do About Household Ants*). **Cottony maple scale** eggs are conspicuous now and should be hatching soon. They normally do not seriously injure healthy, mature maples and usually are not abundant more than a few years in a row (see FO-1019, *Scale Insects of Trees and Shrubs*). We are just starting to get calls on **rose chafers**. They love to feed on roses and peonies but will feed on trees and shrubs. We had one report of rose chafers eating oak and elm seedlings. **False Japanese beetles** are out now. They have been reported on roses, although they are capable of feeding on a variety of flowers and plants. They are similar to Japanese beetles but lack the white patches along the side and tip of the abdomen. Control both types of

beetles by handpicking or insecticides (e.g. acephate (Orthene), carbaryl (Sevin), or malathion). A cheesecloth barrier higher than the plants will exclude rose chafers. We have received calls from central and northern Minnesota complaining about horse flies and deer flies. Immature flies are aquatic or semi-aquatic. The adults are strong fliers and can be found far from their larval sites. Except for protective clothing (long sleeved shirts, pants, hats), there is no effective control against these biting flies.

Still around: **Fourlined plant bugs** are still common. **Mountain ash** and **yellowheaded spruce sawflies** are still reported, although not as common as last year.

Insect alerts: **Squash vine borers** are just getting started in squash, pumpkins, and other vine crops. Starting July 1, we can anticipate **apple maggot** adults emerging from the soil and attacking apples.

Jeffrey D. Hahn
Asst. Extension Entomologist

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CROP

From the
Crops System Team
of the
Minnesota Extension Service

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Uneven Corn

Some corn growers have reported that corn growth is very uneven in some fields. In the same row there are plants of normal height as well as plants that are severely stunted. There is no consistent pattern to this uneven growth.

It would be nice if there was an easy and simple explanation for this problem. Unfortunately, there isn't. There are two soil-related factors that can cause uneven corn growth.

Compaction: Many of the stunted plants have a poorly developed root system. These stunted roots are restricted from normal development by the compaction. Soil conditions at planting this spring were less than ideal and compaction could be a common problem.

Starter Fertilizer Placement: After digging plants in some fields, it appears that the starter fertilizer band was placed at some level above the seed even though the band was 2 inches or more to the side of the seed. With this type of placement, roots of young corn plants did not reach the starter fertilizer resulting in stunted plants. When the starter band was placed below seed level, roots of the young plants reached the fertilizer and there was normal growth. This problem serves as a reminder that starter fertilizer, when used, should be placed below seed level.

There is nothing that can be done at this time to correct the problem. Some cultivation followed by a nice rain would certainly help.

George Rehm
Extension Soil Scientist

Highlights...June 23, 1995

Uneven Corn
Corn - Watch Early-Planted Fields for European Corn Borer
Corn - European Corn Borer captures Carrots and Lettuce - Aster Leafhopper
Alfalfa - Potato Leafhopper
Dial U
Apple Scab Is Here Again
Disease Tip
Entomology Notes
Mole Patrol
Heat Means Time To Water, Mulch

Corn

Watch Early-Planted Fields For European Corn Borer

Corn has really grown over the last week with the hot, dry weather. Looking at corn development through southern Minnesota last week, the frequency of fields above knee-high decreased generally from SE to SW Minnesota. Even in areas with delayed planting at least some fields are tall enough to support borers. Three scenarios are possible. If the majority of fields were planted over a short time period as in SE and SC Minnesota, we could see a "dilution effect" where moths colonize a large number of fields. If a few fields in an area were planted early with gaps in planting dates leading to differences in corn






CORN/Continued


development, moths will congregate in the taller, earlier-planted fields leading to intense infestations in the early-planted fields. If planting is uniformly late and corn is less than knee-high, larval mortality could be quite high and few problems are expected.

Scout early-planted fields.....They are a barometer or window into first generation infestations. Search initially for pinholes on newly emerging leaves. That sign is an indication that newly hatched larvae are feeding. If your "barometer" fields approach 40% of the plants with leaf injury, its time to switch to pulling whorls. Larval survival can vary quite widely with weather conditions and corn development so looking at borers/plant provides a more realistic assessment of potential losses than signs of leaf feeding. Looking at larvae also provides insight into their development, feeding sites, and the application window for insecticides.

Visit 5 locations per 40 acres. At each location, quickly estimate shotholing from 20 plants and then dissect the whorls from at least two infested plants (leaf injury visible). The more plants that you examine for larvae, the better your estimate of potential yield loss and the benefits of insecticide application. Note larval size as it provides insight into the application window. Borers will

begin tunneling into leaf midribs, rolled whorl leaves and tassels during the third stage. By the fourth stage a large proportion of the larvae will tunnel into the stalk and the window of opportunity will be lost. **START SCOUTING THIS WEEK!**

European Corn Borer <i>Ostrinia nubilalis</i> (Hübner)		
Larval Instar	Body Length Range (mm)	Prothoracic Shield Width (mm)
1	1-2 	0.3
2	3-4 	0.4
3	5-10 	0.7
4	12-16 	1.0
5	19-25 	1.7



Note: This larva is shown larger than life size.
IOWA STATE UNIVERSITY

European corn borer larval stages.

Table 1.

CALCULATED TREATMENT DECISION FOR EUROPEAN CORN BORER

Step 1. Calculate average borers per plant in field.

Borers/plant = proportion of plants infested X larvae per infested plant

Step 2. Estimate value of crop.

Crop value (\$/acre) = expected yield (bu/acre) X expected price (\$/bu)

Step 3. Determine dollar value of loss per borer (assumes one larva/plant)

Loss per borer = crop value X .05

Step 4. Calculate expected loss of infestation.

Expected loss (\$/acre) = loss per borer X borers per plant

Step 5. Since all loss cannot be prevented by an insecticide application, correct for insecticide effectiveness.

Preventable loss = Expected loss X insecticide effectiveness

Step 6. Compare insecticide cost (including application cost) with preventable loss.

If preventable loss is greater, then treat the infestation. Treat only when economic return is clear cut!

Example: Assume you found 60% of the plants shotholed with 2.5 larvae per infested plant. Expected yield is 120 bu/acre and price is \$2.55. Pounce 3.2E @ 6oz/acre cost ca. (\$18/acre) applied.

Step 1. Field average = 0.6 X 2.5 = 1.5 borer/plant

Step 2. Crop value = 120 X 2.55 = \$306.00/acre

Step 3. Loss per borer = \$306 X 0.05 = \$15.30/acre

Step 4. Expected loss = \$15.30 X 1.5 = \$22.95/acre

Step 5. Preventable loss - \$22.95 X 0.85 = \$19.51/acre

Step 6. Preventable loss is little more than the cost of the insecticide.

Decision: Farmers call. What profit margin does he expect?

Hot dry weather has three effects on the infestation potential:

- ✓ Dew formation triggers both mating activity and egg laying and is critical to egg production. Several consecutive nights without dew could reduce mating effectiveness and egg production. Moth longevity could be reduced.
- ✓ Borer survival could be reduced by hot, dry daytime conditions. Egg masses are known to detach from leaves under dry, windy conditions. Mortality of newly hatched larvae may be accentuated by hot, dry conditions as they migrate from egg masses on the underside of lower leaves into the whorl.
- ✓ Corn and corn borer development is speeded up. Corn growth decreases its ability to resist corn borers. Rapid corn borer development decreases its window of vulnerability to insecticide application.

SCOUT EVERY 3 TO 4 DAYS IN THIS HEAT! You don't want to be caught flat footed by a rapidly closing or closed window of application because a severe infestation was discovered too late.

Use the decision approach outlined in **Table 1**. This calculated threshold allows you to tailor the decision to each field situation. A big change from previous years

will be the elevated corn price. Don't spend much time anguishing whether or not to treat a field. If the larvae are young (second stage) and insecticide application is readily available, wait 3 days and scout the field again. Since insecticide application is not prevalent against corn borer, make the first treatment experience a good one with a clear cut economic outcome. **DON'T TREAT FIELDS NEAR THE BREAKEVEN POINT!**

Liquid insecticides such as Ambush 2E (9.6 oz/acre), Pounce 3.2E (6 oz/acre) and PennCap-M 2 FM (1.5-2 qts/acre) provide 80-95% control in our trials. Granular products such as Lorsban 15G (4.4-6.5 lbs/acre), Dyfonate II 15G (5-6.5 lbs/acre) also provide excellent control but finding an aerial applicator and ground rig equipped for granules is difficult. Whorl-directed applications of either liquid or granular products can improve effectiveness or offer the opportunity to reduce application rates. Consult the label or technical representatives of the company for recommendations on rates for whorl-directed applications. *B.t.* insecticides such as Dipel or Condor can be very effective but must be targeted at young larvae.

Ken Ostlie
Extension Entomologist

Corn

European Corn Borer

Moth catches in blacklight traps increased substantially this past week, with a peak of 170/night at one of our traps at Rosemount (Dakota Co.). The table on page 104 summarizes trap catch data sent in to the MDA network, provided by Dr. Dharma Sreenivasm. ECB degree-days (base 50°F) as of June 19th range from 580 at Alexandria to 641 at Waseca, indicating we are still at peak (50%) flight for the first generation emergence. Eggs are being laid in field and sweet corn near LeSueur and Rosemount, where we are intensively sampling fields. Despite the high moth counts, egg-lay is still relatively low, ranging from 2 to 4% of plants infested with egg masses. Larvae, however, that hatched from the earliest egg masses are doing well and feeding in the whorls.

European Corn Borer Light Trap Data, June 13-20, 1995

Location	Avg./Night	High/Night
Morris #1	15.8	75
Lamberton	0.4	1
Jeffers (SW)	36.5	68
Olivia	17.6	35
Le Sueur E.	40.5	96
Sleepy Eye	24.3	26 (3 nights only)
Sleepy Eye	6.8	22
Simpson (SE)	15.2	29

** Also note that the pyrethroid Warrior (which many of you have known as Karate) from Zeneca is now labelled for sweet corn. I will pass on label details as soon as possible. One to two applications of this material have been very effective in our annual insecticide trials for ECB and corn earworm.

Bill Hutchison
Extension Entomologist

Carrots & Lettuce

Aster Leafhopper

ALH populations are very high in some fields in the Anoka area that have not been treated, ranging from 100 - 200 per 100 sweeps!!! Early MN estimates of the infectivity level this year are very low, at approx. 0.8% of the ALH carrying the mycoplasma pathogen. However, at some of ALH densities we are finding, there are ample numbers of ALH to vector the disease. At these infestation and infectivity levels, growers should be treating fields with labelled insecticides when ALH reach 10-20/100

sweeps. Lettuce is **VERY** susceptible and should be checked carefully. Review the 1995 *Commercial Vegetable Guide* (BU-1880) for recommendations. Also note that a new pyrethroid, Baythroid 2E (Bayer) is now labelled for ALH on carrots at 1.6-2.8 fl. oz. product/acre; a max. of 5 applications are allowed, at least 7 days apart. **Do not apply to crops grown for seed.**

Bill Hutchison
Extension Entomologist

Alfalfa

Potato Leafhopper

PLH are present in central, south-central and southeastern Minnesota. However, infestations to date, have been minimal, ranging from 2 to 12/100 sweeps.

Bill Hutchison
Extension Entomologist

Dial U

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Apple Scab Is Here Again

The fungus which causes apple scab is once again infecting susceptible apples and crabapples, causing the leaves to fall. The infection actually began during wet weather in May when spores overwintering in leaves on the ground were shot up into the air, landed on the foliage, germinated like seeds and grew into the leaf. The resultant fibrous lesions are olive brown in color, with a tendency to occur along the veins. The green color of the leaf may persist around the lesion while the rest of the leaf turns yellow and drops. Spores produced on lesions start new lesions during wet weather all summer long. Disease management is important. Remove fallen leaves and avoid using sprinklers which get the foliage wet. Water the turf near the tree early in the day. On highly susceptible apple varieties a fungicide should be applied beginning just before the first blossoms open to protect the leaves and young fruits. When purchasing new trees, check the tags for resistance to apple scab.

Disease Tip

Plants with root rots tend *not* to show symptoms during cool, wet weather. However, recent high temperatures and lack of rain will result in sudden wilting, dieback and in some cases death. Check the roots for poor development and rotting when you dig out the plant to confirm the diagnosis.

Cynthia Ash
Assistant Plant Pathologist

Entomology Notes

Carpenter ants remain our number one question (see *Carpenter Ants, FO-1015*). We are still receiving a lot of calls about **insect and mite galls**. Maple bladder gall, maple velvet gall, and cooley spruce gall have been most commonly asked about (See *Plant Galls, FS-1009*). **Four-lined plant bugs** are still common. People have reported them on mint and a variety of perennials. Fourlined plant bugs have one generation and should be finished feeding by about mid-July (or about 6 weeks after they started). **Spittle bugs** continue to be seen on perennials and pine (pine spittle bug). Reports have usually indicated small numbers present. **Honeylocust plant bugs** have been commonly seen lately. Some people describe them as large, green aphids. They have one generation a year; adults should not be seen past July. We have had some **yellowheaded spruce sawfly** calls but nothing like we had last year at this time. We have just started receiving calls about **honey bee swarms**. Swarms are temporary and should move on after a few days. Another option is to call a local beekeeper to see if there is any interest in capturing the swarm. If they try to take up residence in your home, they should be controlled before they become established. Use dusts available to home dwellers (bendiocarb or chlorpyrifos) or hire a pest control company.

Jeffrey Hahn
Assistant Extension Entomologist

Mole Patrol

Mole damage to yards and gardens can be dangerous, unsightly and frustrating. Moles create “raised” tunnels as they move about underground in search of insects. The most effective means of control in this case is a mole trap, preferably the harpoon or choker-loop types found in most hardware stores or farm and garden centers. Moles are especially active at night, so you’ll want to concentrate your efforts accordingly. In late afternoon, inspect your yard for what appears to be the most recent damage. Step down on the tunneling in at least three areas. Return 1/2 hour later to see if the tunneling has raised back up. If it has, place the trap in a tunnel in that area. One comforting bit of information: moles are extremely territorial, so the chances of you having more than a few in your yard are slim. One mole, however, is capable of an incredible amount of damage. See also *Moles and Shrews, FS-1139*.

*Julie Wermerskirchen
Wildlife Technician*

Heat Means Time to Water, Mulch

Hot weather has hit Minnesota with a vengeance. Even though temperatures won’t always be in the 90’s, the onset of scorching heat means we need to pay more attention to watering landscape plants, lawns and gardens. Repeated cycles of wilting inevitably prove damaging and should be avoided in so far as possible.

Water early in the morning. Temperatures are cooler and it’s generally less windy. This results in a reduction of water lost to the atmosphere through evaporation. At the same time, foliage dries faster than it would if you water at night, so there’s less promotion of disease.

Leave sprinklers on long enough to soak the soil thoroughly; repeated shallow watering results in shallow root growth which leaves plants particularly vulnerable in hot, dry weather. How often you water depends on your soil type.

If you know your lawn is shallow-rooted, or it’s suffered from patch disease, then you should water more frequently, but not as deeply. (Mowing grass on the tall side — 3 or 3 1/2” — protects it from heat and sun and also encourages deeper root growth.)

It’s a myth that watering in the heat of the afternoon will damage or burn plants. Quite the opposite; it will cool them off. Of course, it’s best to water thoroughly, but if plants look like they’re about to droop, a light watering can tide them over until you’re able to water them more heavily. This is true of both lawns and gardens.

Finally, if you can’t water at an ideal time, water when you can. In hot weather it’s more important to prevent moisture-stress than to water when it’s “best.”

*Deborah Brown
Extension Horticulturist*

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MINNESOTA

Vol.
No.**CROP**

NEWS

From the
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ST. PAUL

AG Expo Features Value Added Products

VAP'95 brochures are arriving in mailboxes across the area announcing an ag exposition to be held Thursday, July 6, in Montevideo, MN. VAP'95 (Value Added Products '95) will feature specialty crops and livestock as well as value-added ideas to boost income for ag producers and agribusinesses in western and central Minnesota.

Over 40 seminars will be taught by successful entrepreneurs. An increasing number of farmers are adding specialty crops to diversify their traditional farm operations. By utilizing the concept of niche or specialty markets and providing added value through processing new products, farms and small town businesses can supplement income and remain in this part of the state.

Come and spend a day exploring the exhibit area, attending workshops, and enjoying lunch with Tina and Lena, Lynn Ketelsen's noon farm show, and Congressman David Minge.

The VAP'95 Exposition runs from 9 a.m. to 5 p.m. at the High School and the Training and Community Center on the east side of Montevideo. The conference is sponsored by the Minnesota Extension Service, AURI, Region Development Commissions 6W, 6E, and 8, Prairie Country and WesMin RC&D Councils, Swift and Pope County Economic Development, and Montevideo Community Education.

Advance registration is \$8 which includes lunch, refreshments, and workshop materials. Registration at the door is \$10. For more information, call the Chippewa County Extension Office at 1-800-247-0412, or AURI, Morris at (612) 589-4532.

Roger Larson
Chippewa Co. Extension Educator

Highlights...June 16, 1995

Ag Expo Features Value Added Products
Cultivating Continuous Corn
Light Green Wheat
Interpretation of Petiole Nitrate Tests for Irrigated Potato Production
Corn
European Corn Borer
European Corn Borer Trapping
Colorado Potato Beetle (CPB)
Sunflower Beetle Adults
Alfalfa - Potato Leafhopper & Spittlebugs
Dial U
Grass is Going to Seed; Good or Bad?
Mountain Ash Sawflies
Entomology Notes
Maple Problems
Puffy Plum Pockets Plentiful!
Other Diseases To Watch

Cultivating Continuous Corn

With the recent flush of weeds in corn, a cultivation may help improve many weed control programs. Bill Lueschen, Superintendent and Weed Scientist at Lamberton Experiment Station, sums up the effect of cultivation on weed control with an anecdote—he has yet to observe a weed that is resistant to steel!

Cultivating row crops is not only a good weed control practice, it allows the farmer to see first hand the effectiveness of the herbicide program and to possibly detect other pest or crop problems. A tillage study in

For more information contact Extension Plant Pathology at 612-625-6290

Continuous Corn/Continued

Fillmore County with five years of continuous corn, showed an average yield increase from 4 bu/A to 9 bu/A with one cultivation. The main tillage plots were no-till, disk, chisel, and moldboard plow that were split with cultivation and no cultivation treatments.

This study demonstrated that as tillage becomes more intensive, the effects of cultivation are reduced. Thus,

continuous corn grown with no-tillage or reduced tillage on well drained soils should have at least one cultivation to complement the herbicide program. Also, fields with silt loam and silty clay loam soils that can form a surface crust following intense rainfall will benefit from cultivation by improved infiltration and water conservation when soils are dry and by improved aeration when soils are wet.

Tim Wagar
Extension Educator—Crops and Soils

FILLMORE COUNTY TILLAGE
1985 - 1989

	NT	Disk	Chisel	Moldboard
No Cultivation	148	155	158	161
Cultivation	157	162	163	165
Increase from Cultivation	9	7	5	4

Light Green Wheat

There has been some concern that a number of wheat fields have a light green color this year. Many thoughts turn to nitrogen when this color appears. There are actually several factors that can cause these symptoms—nitrogen deficiency is only one.

There is a good possibility that roots have been restricted because of soil compaction created during this spring's tillage and planting operations. Restricted root systems cannot absorb all of the nitrogen needed or reach the nitrogen in the soil. Therefore, plants growing in these compacted conditions take on a light green appearance.

Nitrogen fertilizer can be applied during the growing season if concern for nitrogen loss is justified. A soil test for nitrate-nitrogen ($\text{NO}_3\text{-N}$) can be used to help predict if in-season nitrogen would be beneficial. This test

is based on the results of research conducted in farmers' fields in northwest Minnesota for three years.

For ease of sampling, the soil should be sampled to a depth of 12 inches. Collect at least 12 cores from no more than 40 acres. If the $\text{NO}_3\text{-N}$ in this 12-inch zone is more than 12 parts per million (ppm), do not apply any additional nitrogen fertilizer. If the concentration of $\text{NO}_3\text{-N}$ in this 12-inch zone is less than 12 ppm, add another 30-40 lb. of nitrogen per acre.

When thinking about nitrogen rates, keep in mind that yield potential has been reduced substantially by delayed planting and recent warm temperatures that may have a negative impact on tillering. The use of the in-season soil test would be most appropriate for situations where yield potential is 50 bu./acre or higher.

John Lamb and George Rehm
Extension Soil Scientists

Interpretation of Petiole Nitrate Tests for Irrigated Potato Production

Petiole analysis is a method commonly used to monitor nitrogen (nitrate) status of the potato crop during the growing season. Other nutrients can also be monitored using petiole analysis; however, nitrogen is the one nutrient that is often limiting during the growing season on sandy soils

and can be corrected with liquid nitrogen applications through the irrigation system. Petiole analysis takes some of the guesswork out of deciding whether an application of nitrogen is needed.

Two options are now available for determining petiole nitrate levels. One option is the traditional approach based on sending the petiole samples to a laboratory and receiving nitrate concentration results on a dry weight basis. A newer option recently developed is a "quick" test approach where nitrate in the petiole sap is measured directly on a portable flat membrane electrode (Cardy meter). The two approaches are highly correlated and both give a reasonable estimate of crop nitrogen status. The main advantage of the quick sap test is that results can be obtained the same day.

Sample collection: The procedure for taking petiole samples for both traditional and quick tests is the same. The first fully expanded leaf from the top (usually the 4th or 5th leaf) should be sampled. Remove the leaflets and save the petiole (stem portion). At least 30 to 40 petioles are required for an adequate sample. Usually samples are collected during the period between final hilling and tuber bulking (mid-June to late-July for Russet Burbank). Samples should be collected at 7 to 10 day intervals. For the traditional approach, samples should be sent to a laboratory as soon as possible in paper bags. Select a reputable laboratory with the quickest turn around time. For the quick test, petioles should be placed in plastic bags in a cooler. Sap can be expressed with a

garlic press or by crushing the petioles in the plastic bag with a rolling pin. Expressed sap should be analyzed as soon as possible following calibration directions of the manufacturer. There is a learning curve for operation of the Cardy meter. Therefore, it is recommended that both the traditional and quick tests be run simultaneously the first year to ensure that proper results are obtained.

Interpretation: Because the traditional test is based on dry weight and the quick test is based on fresh sap, the nitrate values obtained will be different. The table below gives guidelines for interpreting the values for both the traditional test and the quick test. This table is based primarily on research for Russet Burbank, but should be useful as starting point for the interpretation for other varieties. Note that as the season progresses, nitrate-nitrogen in the petiole declines. Therefore, the actual level of nitrate-nitrogen in the petiole will vary with stage of development. If petiole nitrate is below the optimum range, then 20 to 40 lbs N/A as UAN (28%) through the irrigation system is advisable. Keeping yearly records of petiole nitrate status and final tuber yield/quality will help in making nitrogen fertilizer management decisions.

*Carl Rosen
Extension Soil Scientist - Horticulture*

Optimum concentration ranges of nitrate-nitrogen (dry weight and sap basis) in potato petioles at various stages of growth.

<u>Stage of growth/time of year</u>	<u>Optimum range</u>	
	<u>Dry weight basis</u>	<u>Sap basis</u>
	<u>% Nitrate-N</u>	<u>ppm Nitrate-N</u>
Early tuber set/June 15-June 30	1.7 - 2.2	1300 - 1600
Mid season/July 1-July 15	1.1 - 1.5	900 - 1200
Late season/July 15-August 15	0.6 - 0.8	500 - 800

Corn

European Corn Borer

Moths have been trapped at most sites in southern and central Minnesota, with significant catches at some sites for this early in the season. As of June 12, 1995, degree-day accumulations range from 382 at Alexandria to 464 at Waseca, which indicates we are well into the first flight (but still not at peak [50%] flight). For example, many pheromone traps are catching up to 20/night. Blacklight trap data summarized by MDA (Dharma Sreenivasm) for the past week (through Tues. 6/13), showed avg. catches of 1-9/night and max. catches ranging from 2-28/night (males + females combined) for southern Min-

nesota. Of these traps, Blue Earth and Le Sueur-East had the highest counts (7-9/night).

However, we have also not yet detected any egg-lay where tall (>17" high) corn is available at either our Le Sueur or Rosemount egg sampling locations (P.S. there is not much tall corn available). So, although female moths have been out for about 1½ weeks, I am not sure where they are laying eggs. I will have more detailed information on ECB trap catches next week, which should indicate a significant increase in trap catch given the 85-90°F weather since June 12th.

*Bill Hutchison
Extension Entomologist*

European Corn Borer Trapping

Moth emergence is well underway (see light trap data) with activity in corn fields increasing. Female moths are ready to mate 2 days after emergence when they congregate in grassy action sites to drink dew and "call" males to them with pheromone just after dusk. Two nights later, they're ready to lay eggs....up to 600 over the next 10-14 days. Egg laying and mating are triggered by dew formation and favored by calm nights with temperatures (°F) in the 60s. Warm evening temperatures, breezes subsiding in the evening and rising dewpoints should provide ideal conditions for egg laying through much of this week.

Besides moths and appropriate weather, corn development provides the third key ingredient.

Young corn (<16" extended leaf height) has high levels of resistance from DIMBOA, a natural plant product that prevents newly hatched corn borers from feeding and increases borer mortality. Older plants are more susceptible as DIMBOA concentration decreases. Coincidentally, moths prefer taller, earlier-planted fields that are less-protected by DIMBOA but larvae survive best on corn with 22-23" extended leaf height will lay eggs on smaller plants if no options are available. With the wide variation in planting conditions around Minnesota this spring, it's hard to generalize about the overall sus-

ceptibility of corn in Minnesota. Areas with good planting conditions will find many fields capable of supporting larvae. In contrast, areas with drastically delayed planting may have few fields capable of supporting larvae at this time but the moths will be laying eggs anyway.

Given this variation, what are sound scouting tips? Always target earlier planted fields first. Begin scouting when corn reaches knee height. A more precise rule on when to initiate scouting is based on degree days. Begin scouting corn about 100 degree days (time required for egg hatch) after corn reaches 18" extended leaf height. This week we're accumulating from 20-25 heat units per day, so scouting could begin as little as 4-6 days after corn reaches 17" extended leaf height. Once shotholing is noted, start looking at whorls to gauge larval survival. I would not worry about fields with less than 40% shotholing but, instead, revisit the fields in 3 to 5 days to see if the situation has changed. More information on scouting and decision-making for first generation infestations in southern and central Minnesota can be found in fact sheet FS-5969 *A Quick Guide to European Corn Borer Management: Scouting and Decision-Making First Generation*.

Ken Ostlie
Extension Entomologist

Colorado Potato Beetle (CPB)

Adult trapping Colorado Potato Beetle (CPB) in the Big Lake-Clear Lake, area of Minnesota. Adult corn root-worm traps (4.17 sq ft soil surface area) were used to collect and count emerging adult CPB populations. Traps had a 20" x 30" wooden frame base and an attached window screen cone. We closed the top of the collecting cone with cheesecloth in order to retain beetles in the trap. Traps were placed in pairs, each pair 20 to 80 ft apart, with 3 or 4 pairs per grower cooperators. We at-

tempted to pick locations in shelter belts, roadsides and building sites that were near 1994 potato fields and that growers indicated were historical beetle overwintering sites.

Earlier in the season we attempted to collect beetle counts weekly but it was very difficult to see beetles within the trap. Traps were removed on June 4 and adult beetles collected within and on the outside of the trap. Counts were recorded and are reported here.

Grower Number	No. of adult beetles					
	Standing on outside of trap			Inside trap		
	low	avg	high	low	avg	high
1	0	2.5	6	0	5.8	21
2	0	22.0	52	0	86.7	256
3	0	0.5	2	0	6.5	26
4	0	0.3	1	0	7.3	29
5	0	0.0	0	0	0.0	0
6	0	9.5	11	0	36.0	48

Overwintering sites with the larger number of beetles were characterized by fairly dense organic matter on the soil surface and non-compacted soil. Numbers were usually low in conifer shelter belts probably because of the lack of plant cover of the soil surface and lack of non-conifer organic matter. It's interesting to note that on every farm, despite selecting what we believed to be good

wintering sites, we had at least one trap without a single adult beetle.

I collected dead adult beetle counts in a large number of fields treated with Admire and adjacent to the traps. Counts were made of 3 row ft in the outside row of the field, the 5th, 10th and 20th row or more, from the field edge.

Field number	No dead beetles/ 3 row ft			
	Row number			
	1	5	10	20
1)	382	66	7	2
2)	31	7	2	1
3)	164	28	5	2
4)	11	4	1	<1
5)	64	13	3	1
6)	7	1	0	0
7)	79	6	2	<1
8)	197	15	4	2
9)	121	23	6	4
10)	29	8	1	1

The pattern of dead beetles with huge numbers in the first couple of rows of the potato field suggest the possibility of future bordering of fields with one insecticide, and foliar application over the main portion of the field with a second provided an effective new foliar be-

comes available. New Leaf® potatoes are also escaping adult CPB feeding suggesting we could switch to New Leaf Russet Burbank as part of a regional control program, instead of an all Admire program.

Dave Noetzel
Extension Entomologist

Sunflower Beetle Adults

Howard Person, Penning County Educator Ag, and I looked at several sunflower fields late last week. In our judgement we did not observe a good relationship between beetle numbers and defoliation in untreated fields. The one to two adults per plant action level appears to be underestimating field damage in many fields, sometimes by a considerable margin. Part of the problem is plant size being small in 1995 because of late planting.

I believe that defoliation is a much better way to make a control decision. **WE SHOULD NOT PERMIT DEFOLIATION TO EXCEED 50% OF THESE SEED-LING PLANTS.** At the same time, if defoliation is not

50%, **do not treat** for adults as there will be no yield, nor any other benefit to the grower.

Although adult control has been under way for a week now, and my impression is that adult numbers appear to be declining you should continue to monitor fields. From what I gather, beetles are later in North Dakota, as is sunflower planting.

Howard Person and I were able to establish a replicated beetle control trial near Goodridge, MN. Three quarter sections were divided into 5 large plots/quarter and Asana XL was applied by air in 2½ gallons of total material per acre. Treatments and post treatment beetle counts are as follows:

Treatment	Dosage in lb a/acre	Fl. oz. of Asana XL acre	Acres/gal of Asana	Avg. No. adults per 200 plants
1)	Untreated	—	—	104.0
2)	.001875	.36	352	9.5
3)	.00375	.73	176	0.3
4)	.0075	1.45	88	0.3
5)	.015	2.9	44	0.7

It's quite clear that our lowest adult control label dosage of Asana XL is nearly as excessive as is the label dosage for larval control. This does not mean that we run out and treat every acre of sunflower. The grower only ben-

efits when potential plant damage (>50%) will lead to a yield decrease. This action level is constant no matter what the insecticide cost.

Dave Noetzel
Extension Entomologist

Alfalfa

Potato Leafhopper & Spittlebugs

We continue to find small numbers of adults at selected sites (e.g., Anoka county), but nothing to yet indicate a significant migration into the state — they are very late this year.

Spittlebugs have been more common this year, and I have received a few calls about their damage. As their name implies, these bugs form a distinctive mass of spit near the terminals of the alfalfa stems. The spittle is easy to detect. The nymphs inside the frothy spittle mass are yellow to green, soft-bodied insects. The moist spittle is necessary for optimum survival of the nymphs. Research from Purdue University in the early 1980s provides the most recent information on economic thresholds based on alfalfa price, insecticide control cost, ex-

pected yield, and the number of spittlebug nymphs per square foot. Scout fields by checking at least 10 locations in a given field. To use the threshold, the spittle must be removed to count individual nymphs; a given mass may have one to 25 nymphs (adults, brown in color, will not usually be in the spittle and do not cause damage). Thresholds typically range from 70-100/square foot, for alfalfa that is worth \$85-60/ton, respectively (assuming approx. \$8.00/ac for insecticide control costs). All materials labelled for spittlebug should be effective. Refer to *Insecticide Suggestions for Insect Pests of Field Crops in 1995* (BU-0500) for rates and information on specific materials.

Bill Hutchison
Extension Entomologist

Dial U

Dial U is a user-fee telephone diagnostic clinic for calls and samples related to gardening, landscapes, plant diseases, insects and wildlife associated with the home environment. Calls from the public are taken at 1-900-988-0500 weekdays. A flat \$2.99 charge is billed automatically to the phone from which the call is placed.

Grass is Going to Seed; Good or Bad?

Many of our lawns are going to seed now. It's not unusual to drive through a neighborhood and see lawns that haven't been mowed for a couple weeks, most likely with the idea that those seeds will drop and help thicken the lawn. Unfortunately, that's not the way it works.

Seed production draws heavily on the grass plants' food reserves, slowing down their normal vegetative spread by means of runners. And it's unlikely that any of that seed will actually ripen or make its way to open, receptive soil. Meanwhile, when grass **IS** cut, after having left it grow too tall, most of the blades will be removed, leaving stubbly, wiry stems, and stressed plants.

(Grass should be cut frequently so clippings are only about an inch long; you never want to remove more than 1/3rd of the height at any one time.)

In a nutshell: continue to mow grass frequently to keep it growing vegetatively. Raise your mower blade to 2 1/2 - 3 1/2 inches during the heat of summer, but cut the grass whenever it grows about an inch taller than that, regardless of whether it's trying to make seed — or better yet, **especially** if it's trying to make seed.

If your lawn is thin and would benefit from overseeding, plan on seeding from mid-August to mid-September, depending on how far north you live. You must prepare for the seed by mowing the existing grass shorter, then scarifying the soil with a vertical mower (power rake) or core aerating just prior to planting. In some areas you could rent a slit seeder, a large piece of power equipment that "drills" the seed directly into the ground.

Deborah Brown
Extension Horticulturist

Mountain Ash Sawflies

Mountain ash sawfly larvae have started hatching recently. They are yellow with black spots and are about 3/4 inch long when full grown. They feed gregariously, i.e. in nonsocial groups, and often defoliate a branch before moving on to the next one. Mountain ash sawfly larvae eat the leaf blades, leaving the midveins. Healthy, mature mountain ash trees can tolerate the feeding of sawfly larvae, even if they completely defoliate the tree in a single

year. Unless you are dealing with a very young or unhealthy tree, control of sawfly larvae is not necessary to protect the tree's health.

If you decide control is important, it is best if you treat larvae when they are small (3/8 inch long or less) to minimize damage to the trees. This requires careful monitoring. Check your trees regularly, looking for small worm-like insects. Because they feed in groups, it can be easier to detect them than insects that occur singly. Effective insecticides include insecticidal soap, acephate (Orthene), malathion, diazinon, and carbaryl (Sevin). If the sawflies are only found on a few branches, just spray those areas. It is not necessary to treat the entire tree.

Entomology Notes

Our most frequent question has been about carpenter ants. We have been receiving an increasing number of calls about spittle bugs on perennials. They cause little damage to plants. Tolerate or physically remove these insects. This has been a good year for American dog ticks and blacklegged (deer) ticks. Blacklegged ticks are potential vectors of Lyme disease. See *Minnesota Ticks and Their Control*, FO-1013. It has been recently revised and is worth getting a copy if you haven't seen it. Fourlined plant bugs continue to be common on perennials. We are also still receiving a lot of maple bladder and maple velvet gall questions.

Jeffrey Hahn
Assistant Extension Entomologist

Maple Problems

Silver and red maple seem to have more than their share of black blotches and spots again this season. The blackened areas of the leaf may be mostly along the edges are due to environmental stress, especially hot windy weather or possibly a bacterial blight. With bacterial blight on red and Norway maple blackening may also occur along

the veins. Otherwise, black spots or blotches could indicate insects, mites or fungal diseases. If the spots and blotches are present in the inner and lower parts of the tree, then a fungal leaf spot or anthracnose is likely. If the spots and blotches are found throughout the tree, then insects, mites or perhaps environmental conditions are responsible.

Generally insects, mites and diseases cause minimal damage to the leaves of healthy trees and control is unnecessary. And, as with most insect and disease situations, once you see the problem it's generally too late to apply a pesticide. The best thing to do is to provide extra water during dry periods.

Puffy Plum Pockets Plentiful!

Enlarged bladder-like plums are the result of a fungal infection earlier this spring. Small white blisters develop on the very young fruits and enlarge to produce misshapen, bladder-like light green "fruits." The centers of the "pockets" are hollow and the outside may become covered with a powdery gray fungal growth. Eventually the infected fruits turn light brown, wither, and fall off the tree. Fortunately, plum pockets is seldom more than an oddity, but if necessary it can be prevented by applying Bordeaux mixture in the spring before the flower buds open.

Other Diseases To Watch

Orange rust on wild raspberries, powdery mildew on many hosts, apple scab, black spot on rose, anthracnose on oak, ash and maple and leaf spots on many hosts. **Note:** With suddenly high temperatures following cool wet conditions in which roots developed poorly could result in sudden wilting or plant death, especially on new plants.

Cynthia Ash
Assistant Plant Pathologist

MINNESOTA EXTENSION SERVICE

UNIVERSITY OF MINNESOTA
COLLEGE OF AGRICULTURAL, FOOD,
AND ENVIRONMENTAL SCIENCES

Produced by the Educational Development System, Minnesota Extension Service.

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CROP**NEWS**UNIVERSITY OF MINNESOTA
DOCUMENTS

JUN 18 1995

From the
Crops System Team
of the
Minnesota Extension Service

Sunflower Beetle

Flowers are going to be somewhat later than normal in most areas of the state. Sunflower beetle, after 10 years absence, returned in 1993 and was abundant enough in 1994 to lead to treatment of a modest number of sunflower acres. It is likely this year that adult beetles (overwintering stage) will be waiting for the first true leaves to unfold. For an action level I would not exceed two beetles per plant early season and would recommend the 2.9 fl oz (.015 ai/acre) Asana XL/acre for their control. For moderate infestations, field bordering with the above dosage of Asana XL works very well but often needs to be followed with a larval control application. If this increase in beetle pressure behaves like the early 1980 "outbreak" we should see an increase in 1995 and probably a wider distribution with which to deal. In view of the cutworm risk and the higher probability of sunflower beetle sunflower growers should pay more attention to their fields this season.

Dave Noetzel — Extension Entomologist

Small Grain

We will begin statewide monitoring for insects in small grain early in June. Two students from University of Minnesota Crookston (Mike Rose and Greg Wentz) will be visiting counties this week to establish permanent sample sites. I hope county educators will provide cooperators names, if you haven't already done so. This small grain year is going to be interesting as planting in many counties has been spread over 2 or 3 weeks. Late planted grain, we believe, will be more vulnerable to insect problems.

Dave Noetzel — Extension Entomologist

Highlights...June 9, 1995

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Small Grain
Corn & European Corn Borer
Alfalfa Insects
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Why Flowering Trees and Shrubs Don't Always Bloom
Entomology Notes

Corn and European Corn Borer

ECB flight activity began last week at most southern locations, with up to 70 moths in one night in a pheromone trap near Olivia. Although the beginning of the flight overall is still relatively low (most light traps in the state have ranged from 0-2 up to 15 moths/night), there is a good indication that we could have an above-average moth

flight (indicating that overwintering survival of larvae was good). At any rate, there is still little corn available for oviposition — the earliest planted sweet corn will most likely become attractive sites.

Bill Hutchison — Extension Entomologist

Alfalfa Insects

An average of 2 potato leafhoppers/100 sweeps was detected last week (approx. June 1st) in Fillmore county by Minn. Dept. of Agric. Pest Monitoring personnel. This is still the first and only siting we have to date for PLH. Because of wet, wind weather, however, we were not able

to sweep alfalfa this week at Rosemount. As expected, I am not aware of any significant alfalfa weevil infestations developing this year; most of the overwintering adult egg-lay should be complete by now.

Bill Hutchison — Extension Entomologist

Rotary Hoe Use in Small Grain

The rotary hoe can be effective on shallow emerging weeds, such as pigweed, wild mustard, kochia, lambsquarters and foxtails; however, a rotary hoe will not be effective on wild oats which usually emerge from deeper depths.

The rotary hoe may be used in small grains under the following situations:

1. Small grains planted at least 1 1/2 inches deep.
2. Rotary hoe is adjusted so that it is not working more than 1 inch deep in the soil. Rotary hoeing should be complete before the 2 to 3 leaf stage of the crop.

3. Surface of the soil is dry and the weather is dry and sunny.
4. If you have not used a rotary hoe on small grains before, I would not do a whole field at once. Do part of a field, then check to see if the hoe is pulling out a lot of the plants, if so, readjust the hoe.

Take your time and do not rotary hoe every small grain acre until you are sure you are doing more good than harm.

Heat Canker

Small Grains — Air temperatures in the 80's with sunshine creates soil temperatures that can cause plant injury to both grass and broadleaf crops. In severe cases a constricted area completely girdles the base of the plant at the soil line. This can lead to a toppling over of the plant at that point. In less severe cases, there may be little or no constriction, but as new leaves emerge, they will have one more yellowish to whitish stripes across the leaf - these areas were at the soil line several days earlier when the soil was especially hot. These stripes represent heat injury while the leaf was still in the sheath. No serious damage is expected from this injury.

Broadleaf Crops -- Weather the past few days has been favorable for heat canker. In severe cases a constricted

area completely girdles the base of the plant at the soil line. This can lead to a toppling over of the plant at that point.

Broadleaf crops such as mustard, rapeseed and flax are often killed. Newly emerging plants are more susceptible. Before treating the fields for insects and herbicides assess the stand loss and be sure sufficient plants remain for economic yields. Rapeseed/canola mustard and flax all compensate for reduced stand by more branching. Less than 50% stand will require extra care in weed control and other management to give good yields. Normal stand of flax should be about 70 plants per square foot. Rapeseed/canola and mustard should have 20 plants per square foot at normal seeding rates.

Harrowing for Weed Control

Dry soil surfaces accompanied by warm dry days are optimum conditions to control weeds with a harrow.

Wheat and barley into one-three leaf stage can be harrowed with minimal injury. Wheat can be harrowed twice, while barley should be harrowed only once. It is not recommended to harrow oats. Corn can be successfully harrowed starting at the second leaf stage.

Populations of shallow rooted seedlings of green and yellow foxtail (pigeongrass) and kochia can be severely reduced by timely harrowing.

Harrows should be set shallow, 1/2 inch depth, and operating speeds monitored to avoid crop injury.

A light spring tooth harrow or rotary hoe can be used for weed control in soybean, corn and sunflower, but don't use these tools when the seedlings start to emerge as injury can be severe at this time. Soybeans with the first

true leaves (unifoliate stage), sunflower in the 4-6 leaf stage and corn beyond the spike stage to 3 leaf stage can safely be harrowed. Tines should always be slanted back when harrowing for weed control. Trashy conditions which result in trash build-up in the harrow should also be avoided. Use of harrows and rotary hoes have been most effective at midday or on afternoons when temperatures are warmer and soil surfaces are dry, since these conditions promote weed drying and better kill. Also, less physical crop injury has been observed compared to early morning field operations.

Sunflower can be harrowed 2-4 times during the 4-6 leaf stage of development. If this type of weed control is planned, sunflower should be planted at rates 5-8% higher than normal.

*Harold J. Stanislawski
Otter Tail County Extension Educator*

Replanting for Wheat and Barley

Some soil crusting has occurred resulting in poor stands of wheat and barley. Replanting decisions are difficult because of this late date. Replanting costs must be recovered from a later maturing crop that has a lower yield potential than the original crop. Although this year is an exception because of high soil moisture, replanting uses extra moisture because of soil disturbance. Generally if the reduced stand is uniform (no big skips or holes), then stands of 12 to 15 plants per square foot should be kept. It is possible to drill extra seed into some thin stands but this will result in uneven maturity causing difficulty during harvest. Replanting wheat or barley

after June 1 in northern Minnesota and May 15 in southern Minnesota will result in a 50% yield reduction due to late planting compared to the normal planting date. Consideration should be given to planting a crop other than wheat or barley if base acreage protection is not a factor.

Other crop choices are limited. Crops to consider are soybeans, flax, proso millet, buckwheat, dry beans, and mustard in northern Minnesota. Canola is another possibility but yields can also be reduced for this crop when planting late.

Ervin A. Oelke — Extension Agronomist - Crops

Late Sidedress and Supplemental N Application for Corn

Sidedress applications for corn can be made when the corn is just a few inches tall. An early application allows the N time to get to the active rooting uptake region in the soil for the period of rapid uptake (July) and allows for better time management by the producer.

Anhydrous ammonia is the standard for sidedress/supplemental N applications. Drawbacks are: 1) the soil has been saturated and the sealing of the slot may be poor and, 2) this method also can be time consuming.

Broadcast urea applications may be a feasible alternative. Rainfall occurring within several days after application or a cultivation both curtail any volatilization concerns. Although some minor burning could occur when urea granules get into the whorl, this slight burn is

simply cosmetic and has no effect on either growth or yield.

Liquid N can also be easily used in sidedress applications as it is easy to use with a cultivator and, if the corn is tall, it can be dribbled on the soil surface with high-clearance equipment. Best Management Practices (BMPs), endorsed by the University of Minnesota state that sidedressed N should be incorporated or placed to a depth of 4 inches. This is to avoid the possible problem of roots being active below where the N was placed, especially in drier years. Of course, using liquid N with irrigation water is a recommended practice.

Mike Schmitt — Extension Soil Scientist

Is Supplemental N Needed for Corn?

As this year's corn crop is finally getting completely planted, many people are concerned about their nitrogen (N) management program. Do I need more N than what I had put down last fall? Some areas have had plenty of rain to make this question pertinent. For the most part, the soil temperatures this spring were cool enough that previously applied N was not quickly converted to nitrate-N, which is susceptible to loss.

A simple "scorecard" has been devised that should help one decide if supplemental, or extra, N is needed. This decision aid was slightly altered this year to accommodate fertilizer N form and placement. Keep in mind that good judgement is still important when using this simple decision aid. Also, each field needs to be evaluated individually.

Factor 1: What N product was used?

	<u>Anhydrous Ammonia with N-Serve</u>	<u>Anhydrous Ammonia</u>	<u>Urea Banded</u>	<u>Urea Broadcast</u>
Score:	2	3	3	4

Factor 2: When was the fertilizer N applied?

	<u>Fall</u>	<u>Early Spring</u>
Score:	4	3

Factor 3: What has been the predominate soil moisture status in the field this spring?

	<u>Standing Water/Saturated</u>	<u>Wet</u>	<u>Normal</u>
Score:	4	3	1

Factor 4: What is the crop's current condition?

	<u>Chlorotic/ >12" Tall</u>	<u>Chlorotic/ <12" Tall</u>	<u>Green/ <12" Tall</u>	<u>Green/ >12" Tall</u>
Score:	5	3	2	1

Now: Total the score for the 4 factors and use the following guidelines.

<u>Less than 10</u>	<u>1-12</u>	<u>13 or more</u>
No supplemental N is recommended	Re-evaluate in one week	Add an additional 40-70 lb N/acre

The "re-evaluation" option is only viable until you no longer have sidedressing options. Research work from Illinois has found that 50 lb N/acre as a supplemental N rate was satisfactory for a wide range of conditions. While

a total score of 13-15 would merit a 40 lb/acre N recommendation, a total score of more than 15 may require a higher N rate.

Mike Schmitt — Extension Soil Scientist

Postemergent Herbicides on Small Grains

Postemergence herbicide applications are now being applied to small grains. The following is a list of small grain growth stages and weed growth stages for the various small grain herbicides.

Timing of Postemergence Herbicide Applications in Small Grains

<u>Herbicide</u>	<u>Small Grain Growth Stage</u>	<u>Weed Growth Stage</u>
Broadleaf Herbicides:		
Buctril	wheat/barley/oats - Emergence to boot stage.	Until the 4-leaf stage or 2" tall
Bronate	wheat/barley/oats - 3 leaf to boot stage.	Until the 8-leaf stage or 4 " tall
Banvel	wheat/oats- 2 to 4 leaf stage, barley 2 to 3 leaf stage.	2 to 3 leaf stage
Curtail M	wheat/barley/oat - 3 leaf stage until jointing.	Until 4" tall
Curtail	wheat/barley - Tillering to jointing stage.	Until 4" tall
Express	wheat/barley - 2 leaf stage and before flag leaf visible.	Until 4" tall
Harmony Extra	wheat/barley - 2 leaf stage until jointing.	Until 4" tall
MCPA	wheat/barley/oats - 3 leaf until boot stage.	Until 4" tall
2,4-D	wheat/barley/oats - tillering until boot stage.	Until 4" tall
Wild Oat Herbicides:		
Assert	wheat/barley - 2 leaf stage to jointing.	1 to 4 leaf wild oats
Avenge	wheat ¹ /barley - before flag leaf emergence.	3 to 5 leaf wild oats
Cheyenne	wheat -3 leaf until jointing (6 leaf stage).	1 to 4 leaf wild oats Hoelon
	wheat - until boot, barley - before tillering.	1 to 4 leaf wild oats
Tiller	wheat - tillering (3-4 leaf).	2 leaf to 2 tiller stage
Foxtail Herbicides:		
Cheyenne	wheat -3 leaf until jointing (6 leaf stage).	foxtails - 2 leaf to 2 tiller stage
Hoelon	wheat - until boot, barley - before tillering.	1 to 4 leaf stage foxtail
Tiller	wheat - tillering (3-4 leaf).	foxtails - 2 leaf to 2 tiller stage
Stampede EDF	wheat - 2 to 5 leaf stage, barley/oat - 2 to 4 leaf stage.	foxtails - 1 to 3 leaf stage foxtail

¹ See label for Hard Red Spring Wheat Variety Restrictions

Beverly R. Durgan — Extension Weed Scientist

Cool Temperature and Herbicide Applications

It seems like we just can not get a break from the weather this year in northern Minnesota. I have received several calls this morning about the "light frost" that occurred last night. Two factors need to be considered when applying herbicides under cool to frost conditions: **Crop safety and weed control.**

Crop Safety -- If frost injury has occurred, such as white or black leaf tips, do not apply a herbicide until the crop has recovered and is showing new growth. Depending on the degree of injury and the weather conditions that occur after the frost, it may take up to a week for the

crop to recover. In the case of a "light frost", 2 to 3 days is generally all that is needed.

Under cool conditions, crop injury potential can increase with several herbicides. These herbicides would include:

Small grain herbicides: Harmony Extra, Express, Hoelon, Tiller and Cheyenne

All of these herbicides can cause small grain crop yellowing, leaf tip burn, and crop stunting when applied under cool conditions. The injury is generally

Cool Temperatures/Continued

temporary, and the crop will recover when temperatures increase.

Caution should be used before applying Hoelon to barley under the weather conditions that we are experiencing now. Hoelon has the potential to give severe barley injury under cool conditions. Read and follow the Hoelon label for restrictions on applications on barley.

Sunflower herbicides: Assert

Assert has the potential to cause sunflower injury if the sunflowers have been damaged by frost. If the sunflower plants are showing signs of frost damage, wait at least 3 to 5 days for the plants to recover.

Weed Control— If weeds are showing signs for frost damage, **DO NOT** apply a herbicide until the weeds show sign of recovering. Delay herbicide applications at least 3 to 5 days.

Under cool weather conditions, herbicides will work more slowly and overall control may be less than under "ideal" weather conditions. Herbicide rates should be adjusted accordingly. When using a herbicide with good crop safety or if risk to temporary injury is acceptable a medium to high herbicide rate will help to off-set the reduced herbicide activity from the cool weather. It may also be advisable to switch to a herbicide that has greater crop safety.

Beverly R. Durgan — Extension Weed Scientist

Minnesota AG Professional Weed Tour

The 1995 Minnesota weed tour will be held on Thursday, June 29 from 9:30 a.m. to noon at the Southwest Experiment Station, Lamberton, MN. Lamberton is located on Highway 14, approximately 7 miles west of Highway 71. The experiment station is approximately 1 mile west of Lamberton on Highway 330. The tour will include an evaluation of the following herbicide resistant crops: sethoxydim tolerant corn, glufosinate tolerant corn, Roundup Ready soybeans, glufosinate tolerant soybeans. Other features of the tour include: evaluation of soil-ap-

plied and postemergence corn and soybean herbicides on common cocklebur; efficacy and economics of corn and soybean weed management; Evaluation of Accent time of application by corn hybrid interactions.

Please note, there will be no scheduled NDSU/Crookston weed tour this year. You will be able to visit these plots at your convenience. Plot guide books will be available after July 5th in the first floor of Loftsgard Hall at NDSU and at the Ag Research Center in Crookston.

*Jeffrey L. Gunsolus and Beverly Durgan,
Extension Agronomist-Weed Science.*

Dial U

Dial U is a user-fee telephone diagnostic clinic for calls and samples related to gardening, landscapes, plant diseases, insects and wildlife associated with the home environment. Calls from the public are taken at 1-900-988-0500 weekdays. A flat \$2.99 charge is billed automatically to the phone from which the call is placed.

Ash Anthracnose Wins Big!

The leaves are once again raining down from susceptible ash trees due to the fungal disease called ash anthracnose. Fallen leaflets are often distorted and have pin point purple to brown spots or larger blotches. This fungus overwinters in the tree releasing spores during rainy periods. Leaves which are not fully developed are very susceptible to infection which explains why we see so much infection and defoliation in extended cool wet springs.

Individual trees vary in their susceptibility to the fungus; some are severely defoliated while others are untouched. It is too late to spray now (fungicides must be applied beginning at bud break) and is seldom necessary on healthy, established trees. Keep the trees as healthy as possible by watering during dry periods and avoiding mechanical or chemical damage.

*Cynthia Ash
Assistant Plant Pathologist*

Why Flowering Trees and Shrubs Don't Always Bloom

Every year we get questions about flowering trees and shrubs that fail to perform as expected. There are, of course, numerous possible reasons.

This year, many flowering crabapples bloomed extremely sparsely because their flower buds were killed by the hard frost in early April. But we also get calls about crabapples and apple trees that have been in the landscape five years or more, and have yet to bloom at all.

Age and size CAN be a factor in whether or not a tree or shrub blooms. Location is also important. Most woody plants with showy blooms need lots of sunlight. One of the most common reasons lilacs fail to bloom is that they're often planted in shady locations. The foliage is OK, but blooming is sparse, at best.

Soil and nutrients can also play a role. Rich or frequently fertilized soil may actually work against good flowering. That doesn't mean that fertilizing is never called for, but it does mean you must be careful not to over do it. Most of these woody plants are surrounded by lawn; some of any fertilizer you use on the grass will find its way into tree and shrub roots, as well.

Pruning may also impact flowering. A lilac that is pruned back heavily may take several years before it blooms again. Fall or winter pruning will remove the next year's flower buds on most shrubs. To avoid this loss, prune shortly after they finish flowering.

There are a few shrubs such as spiraea and hydrangea that bloom on new growth that develops each spring. They can be pruned in late fall, winter or first thing in spring without eliminating flowering.

*Deborah Brown
Extension Horticulturist*

Fourlined plant bug nymphs were spotted in the Twin Cities last weekend. They are bright red and about 1/16 inch long. These bugs eventually grow into 1/4 inch long adults with yellowish green bodies with four black stripes running from head to tail.

Fourlined plant bugs love to feed on perennials, including chrysanthemums, chinese lantern, shasta daisies, and coreopsis and also herbs, such as basil and mint. Damaged leaves show small, round, brownish, sunken areas where the bugs feed.

Despite the damage, their feeding usually just affects the appearance of plants. It is possible that large numbers can seriously injure flowers, although in most cases plants come back next year. Tolerate and ignore small numbers of fourlined plant bugs when possible, especially if you have not see much damage in the past.

If damage is heavy or you wish to preserve the plants' appearance, control is warranted. Spray a labelled insecticide, such as acephate (Orthene), malathion, or insecticidal soap as soon as damage is noticed. Be sure the product you spray has the plant you wish to treat listed on the label. *If you want to treat herbs, the only option is insecticidal soap.*

Entomology Notes:

Colorado potato beetles are laying eggs now. Watch for pinkish humpedbacked-looking larvae in home gardens.

Carpenter ant swarms (i.e. winged queens and males) have been sighted in the Twin Cities. Carpenter ant nests are usually near where winged ants are found. Finding a single queen (with or without wings) in your home usually doesn't mean there is a nest there (see *Carpenter Ants*, FO-1015).

Continue to monitor for **yellowheaded spruce sawfly larvae** on the new growth of spruce. **Ash plant bugs** are common. This is primarily just a cosmetic problem. Ash plant bug damage does **NOT** cause ash trees to drop their leaves now (this is due to a disease called ash anthracnose—see page 92). White, cottony material at the end of pine branches is due to **adelgids** (aphid-like insects). Most callers describe small numbers of insects, not requiring control. **Maple bladder galls** are common on red and silver maples. Galls are rarely harmful to healthy, established plants. Control is not effective once galls are seen.

Past their prime: Full grown (or nearly so) **European pine sawfly larvae and eastern tent caterpillars** have been reported. Do not control them as they are finished feeding. An exception to this would be if you are in northern Minnesota and the larvae are still small (for European pine sawfly larvae 3/8 inch or less, for eastern tent caterpillar 1 inch or less).

*Jeffrey Hahn
Assistant Extension Entomologist*

MINNESOTA EXTENSION SERVICE

UNIVERSITY OF MINNESOTA
COLLEGE OF AGRICULTURAL, FOOD,
AND ENVIRONMENTAL SCIENCES

Produced by the Educational Development System, Minnesota Extension Service.

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CROP**NEWS**

From the
Crops System Team
of the
Minnesota Extension Service

Nitrogen Losses From Denitrification

Recent excessively wet weather has raised questions about loss of nitrogen that was applied last fall or earlier this spring. The loss, through denitrification, would be a concern for the heavy-textured soils of the state. Denitrification is the conversion of nitrate-nitrogen ($\text{NO}_3\text{-N}$) to nitrogen gas. It is a process controlled by bacterial action.

Denitrification requires a saturated soil and warm temperatures. Losses are difficult to predict. Soil temperatures should be warm enough to stimulate bacterial growth (generally higher than 50°F).

Farmland Industries has provided these guidelines for losses that might be expected from denitrification:

Days of Saturation	Temperature ($^\circ\text{F}$)	N Loss (%)
5	55-60	10
10	55-60	25

3	75-80	60
5	75-80	75
7	75-80	85
9	75-80	95

Evaluating Corn Stands

Most of the 1995 corn crop has been planted. Regardless of when the corn emerges, growers should evaluate stands to determine plant population. Important management decisions can be quickly made by assessing the plant population just after it emerges. Basic issues relating to plant population are:

- Is plant population at the intended population goal?
- Is there even emergence?

Expected losses are low when soil temperatures are cool as they have been this spring. Soils must also stay saturated (not just wet) for an extended period before substantial losses can occur.

At this time, there is no reason to believe that substantial losses of nitrogen have occurred for most soils in Minnesota, but there is no test available to measure this loss. If nitrogen loss is a concern, watch your corn closely. If a light green color appears and/or bottom leaves turn yellow in the mid-rib, some supplemental nitrogen may be needed as a sidedress treatment.

George Rehm — Extension Soil Scientist

Highlights...June 2, 1995

Nitrogen Losses From Denitrification
Evaluating Corn Stands
Late Planting Soybean Dates & Yield Loss
Colorado Potato Beetle
Cutworms
Corn, Sweet Corn, European Corn Borer
Vegetables & Aster Leafhopper
Alfalfa
Toxicity of Smallflower Buttercup in Hay
Far-Go (Triallate) and Treflan (Trifluralin) in
Hard Red Spring Wheat and Barley
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In Small Grains
High Temperature Influence on Late Planted
Wheat
Dial U
Maple Bladder Gall
Hollyhock Rust
Shade Trees Leafing Out Slowly, Sparsely

For more information contact Extension Plant Pathology at 612-625-6290

- Is the stand evenly distributed?
- Are any insect, seedling disease, chemical injury problems affecting the stand?
- Will replanting be necessary for all or any part of the field?
- What will be the cost of replanting?
- Will the replant yield potential equal or exceed what is already present in the field? In June, the choice is between existing corn stand, replant, or plant soybeans.

Replant decisions come down to determining if the replant crop yield will be greater than the existing crop's damaged yield. Net return of a replant yield has to cover the cost of both plantings. This table shows percent of optimum yield for different plant populations at different planting dates:

Corn yields planted at various dates expressed as percent of optimum planting date and population yield for uniformly spaced plants within the row.

Date	14	18	22	26	30
	percent of optimum yield				
Before May 1	67	79	88	94	100
May 1-10	67	78	87	91	93
May 11-25	67	76	81	85	87
After May 25	61	68	73	76	76

This can be used as a general guide for making the replant decision. For example, potential yield for 18,000 plants at harvest planted between May 11-25 is no different than 26-30,000 plants at harvest planted after May 25. Table values are based on uniform distribution of plants. Subtract a 5 percent yield loss if field assessment reveals several gaps of 4-6 feet within rows and a 2 percent penalty for gaps of 1-3 feet.

Stand counts are determined by selecting the proper row length in relation to the row width. Three to five stand counts should be taken in different sections of the field and then averaged. This average is then multiplied by 1,000 to achieve the plant population. It is a good idea to check the plant population a few times during growing season to give a better determination of plant stand and yield of harvest.

Row width and length for determining plant population.

Row Width	Distance for 1/100th Acre
22 inches	23 ft 9 inches
30 inches	17 ft 5 inches
36 inches	14 ft 6 inches
38 inches	13 ft 9 inches

Kevin Cavanaugh
— *Integrated Pest Management Specialist*

Late Planting Soybean Dates & Yield Loss

Some soybean producers in southwest and west central Minnesota will have later than normal planting dates due to below normal temperatures and cold, wet soils. Some growers may seriously think about changing their normal maturity group varieties to an earlier one if planting is delayed to mid-June or later. Presently, it is still too early to switch maturity groups.

In most years, about 95 percent of the soybeans are planted by June 15th, with 50 percent of that occurring by May 20. Early planting allows for use of full season varieties to gain higher yields. Approximate percentage yield loss associated with planting dates is shown below. Full season varieties planted between May 20 and June 10 will mature in southern Minnesota before fall frost date, but will have lower yields.

If planting is delayed beyond June 10 in central or southern Minnesota, growers should look at earlier maturity group

soybean varieties. Check with your seed salesperson for availability of early varieties.

Approximate percent yield loss for various planting periods.

Planting Period	Approximate Yield Loss (%)
Late April-Early May	0
Mid-May	10
Early June	0
Late June	40

Kevin Cavanaugh
— *Integrated Pest Management Specialist*

Colorado Potato Beetle

Adult emergence and egg laying is well underway in the Hastings to Clear Lake potato production areas. Early planted fields of most potato cultivars have emerged but not all fields had adults present on May 27. Early observations indicate very modest adult feeding on New Leaf® (transgenic) Russet

Burbanks, with no indication of adult mortality at this point. Admire treated strips, in contrast, had large numbers of dead adults around and beneath plants no more than 4 inches tall. Numbers of dead adults in one field ran from 2 to 150/plant.

It is almost impossible to alter the following seasons popu-

lations of any insect through the use of an insecticide. This area-wide "trial," where perhaps 95 percent of all potatoes were treated with Admire at planting, might possibly achieve

that. But it is also as close to the perfect scenario for the development of resistance to Admire as one could hope to design.

Dave Noetzel — Extension Entomologist

Cutworms

Ken Ostlie reported several cases of severe cutworm damage to sunflower, corn, and soybean. Where Asana XL, Ambush, Pounce, or Lorsban are labeled, all will provide superb cutworm control at labeled dosages. (Asana .03, Pounce or Ambush 0.1, and Lorsban 0.5 lb ai/acre). Efficacy is unaffected by the amount of soil moisture, and none need to be cultivated in. In fact it is best to replant and then broadcast apply immediately

over the replanted crop. I recommend against using Lorsban granular in replants into cutworm infested fields. I have experienced near total failures more than once with granulars, versus total success in the same field with broadcast Lorsban 4E, Ambush, Pounce and Asana XL. The only cutworm which remains tough to control with these is the glassy cutworm.

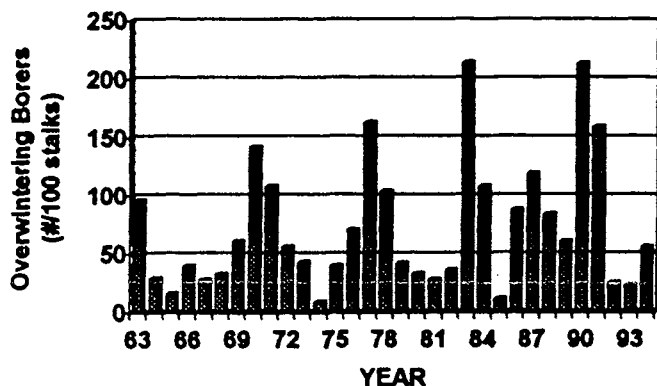
Dave Noetzel — Extension Entomologist

Corn, Sweet Corn & European Corn Borer

Delayed Planting and European Corn Borer — European corn borer (ECB) populations cycle in Minnesota with peaks about every 7-8 years (see graph). After the population "crash" of 1991-1992, ECB populations began to increase last year. If the long-term trend holds true, we should see increased problems this year. A big question is raised by this spring's delayed planting; how will it affect ECB?

Degree-Day Model for Forecasting Timing of First Flight — Degree-day (DD) accumulations are still less than necessary for initiation of the first generation flight (we should be at about 40 percent pupation for southern Minnesota).

Population dynamics of corn borer in Minnesota (Ostlie from MDA data—1994)



If corn planting has proceeded well with a narrow spread in planting dates, relax for the first generation. First flights of moths are attracted to taller, earlier-planted fields. With little spread in planting dates, moths should be diluted and first-generation ECB should be low in numbers. But if your area got 5-10 percent of the corn planted (see comments on sweet corn below) before rainy weather delayed the bulk of planting, watch out! Earlier-planted fields act as magnets for moths over several square miles and infestation levels could be high. If your area has not planted much corn yet, the prospects of first-generation ECB are slim to none. Small corn (< 16 inch extended leaf height) has a high level of resistance and shouldn't be threatened unless the moth flight is correspondingly delayed by the weather. More on ECB as the moth flight begins.

Cumulative DDs as of May 29, and forecast for ECB peak emergence for selected locations (based on 30-yr normal temperatures; 13 to 18 DDs/day from early to mid-June).

Location	DDs	Forecast for Emergence	
		10%	50%
Rochester	219	June 17	June 22
Rosemount	254	June 15	June 21
Waseca	256	June 15	June 20
St. Cloud	211	June 19	June 25

DDs based on double-sine-wave method.

ECB peak emergence forecast is based on a new predictive model for timing of the first flight. It should be applicable for most of south-central and southeastern Minnesota. This table incorporates the variability of the model as measured by a 95

New model's forecast for average number of DDs required for ECB Emergence, Rosemount, Minn., 1991-1994 Data.

% Emergence	Average	(95% Prediction Interval)
10	488	(442 - 530)
25	525	(482 - 568)
50	590	(545 - 648)
75	685	(614 - 833)
90	804	(674 - 1212)

percent Prediction Interval. It summarizes the new model's forecast for the average number of DDs required for first (10 percent) to 90 percent emergence

If there is no major heat-wave in the next week, this year will be a very late year for the first flight in southern Minnesota. However, with many late planting dates and the cool spring, much of the field corn is also progressing slowly. However, sweet corn fields that did get planted early may be the tallest fields in a given region, and be most attractive for egg-lay in June; early sweet corn hybrids should be checked closely

during the whorl stage for damage and larvae. Many of the early sweet corn hybrids are more susceptible to ECB damage than later-maturing hybrids (see 1995 Commercial Vegetable Guide, BU-1880), specifically larvae surviving to infest the ear. For example, early hybrids should be treated for ECB if 10-20% of the whorls have damage AND live larvae, whereas later hybrids such as Jubilee can tolerate up to 50% whorl feeding.

Ken Ostlie, Bill Hutchison & Dave Bartels
— Extension Entomologists & Graduate Research Assistant

Vegetables & Aster Leafhopper

ALH counts have fluctuated considerably in alfalfa fields adjacent to newly planted carrots this past week. However, we still have a good "reservoir" of ALH in the process of moving to carrot and lettuce fields. All carrot growers in southern Minnesota should be monitoring their carrots closely. When nearby alfalfa is cut in the next 2 weeks, we can anticipate significant movement of ALH into carrots. ALH counts in one carrot field in Anoka county averaged 20-25/100 sweeps (on

2-inch carrots) — not a good sign. Counts in nearby alfalfa fields in Anoka ranged from 60-115/100 sweeps — also not a good sign. We have collected ALH and placed them on aster plants in the greenhouse to get an indication of the infectivity level of these leafhoppers. ALH counts at Rosemount on May 31 ranged from 4, 8, 20, 22 and 37/100 sweeps in alfalfa.

Bill Hutchison, Eric Burkness & Patrick O'Rourke
— Extension Entomologist & Graduate Research Assistants

Alfalfa

Alfalfa weevil DDs have reached 300 in southern locations. Low densities of all larval instars have been found at Rosemount and Anoka. Fields will be ready to cut before dam-

age should accumulate in most of the state. We have still not detected any Potato leafhopper in alfalfa, as of May 31.

Bill Hutchison — Extension Entomologist

Toxicity of Smallflower Buttercup in Hay

Smallflower buttercup (*Ranunculus abortivus*) and its relative tallbuttercup (*Ranunculus acris*) are common in north-east Minnesota. Smallflower buttercup is becoming wide spread in southeastern Minnesota this season. Smallflower buttercup reproduces as an annual or biennial plant. Tall buttercup is perennial.

Smallflower buttercup has two distinct leaf types. Young "rosette-like" lower leaves are round, bright green with round toothed margins borne on long petioles arising from the soil surface, vaguely resembling round leaf mallow. Shoots arise with upper leaves divided into 3-5 leaflets on short to negligible petioles. Mature plants are 6-20 inches tall. Yellow flowers have unique small yellow petals with seeds on a round or cone-like head. Seeds are flattened with a curved beak, wrinkled and brownish-yellow at maturity.

Buttercups do best in moist environments. Smallflower buttercup, with seed common in many areas of Minnesota, established very aggressively with the excessive rainfall in 1993. Smallflower buttercup is a prolific seed producer and must start from seed every year (annual) or every other year (biennial). It is important to disrupt seed production to reduce its infestation in hay fields in southeastern Minnesota.

The toxic compound in buttercups is also present in anemone, thus the name of the toxic component:

protoanemonin. Protoanemonin is very labile, meaning it typically degrades to nontoxic anemonin shortly after being cut. Concern for toxicity is with grazing situations or green chop, when high levels of buttercup are present. The toxic compound causes blistering, salivation, diarrhea, and abdominal pain in livestock. Severe toxicity can lead to convulsions and death.

Animals naturally avoid buttercup. In pastures or rotational grazing of alfalfa, buttercup generally results in toxicity where animals are short on other forage and are forced to eat them. In rare instances, animals become accustomed to buttercup once poisoned and revert to eating it again, with possible dire consequences. With green chop, patches of highly infested forage that may be fed can be a problem for individual animals that may receive higher doses when feeding.

The stature of smallflower buttercup is such that much of the leaf area is a prostrate growth form not harvested with forage. Harvested forage primarily contains flowering stalks with relatively low contribution to tonnage. Showy flowers often make buttercup appear to be a severe infestation. You assess severity of infestation by visualizing what your forage cutting height would really contribute to forage yield, without considering the low growing leaf tissue in that harvest.

We do not have a definitive number or threshold below which an amount of buttercup in forage would be considered

safe. Current thinking is that with a ratio of 1:30 to 1:50 or less buttercup:alfalfa-forage, toxicity should not be an issue. We do not have any scientific data to back this up, however, and would caution those who feed buttercup infested forage to watch their animals carefully. The blistering nature of buttercups is actually a blessing, as careful monitoring of animals may show

signs of ingestion via blistered lips, tongue, nose, or mouth before more serious toxicity or death occur. If feeding green chop, or grazing infested fields, watch for these signs and get non-infested forage to animals.

*Roger Becker — Extension Agronomist, Weed Science
Michael Murphy — Veterinary Diagnostic Medicine*

Far-Go and Treflan In Hard Red Spring Wheat and Barley

Because of the cool wet soil conditions this spring, I have received several phone calls on spring application of Far-Go (trilalate) and Treflan (trifluralin) in hard red spring wheat and barley. Potential for crop injury increases under cool, wet soil conditions because the crop emerges slowly and is in contact with the herbicide for a longer period. Also, the combination of these two herbicides have a greater potential for crop injury than either applied alone. These are some ways to minimize crop injury:

- Preemergence incorporated is the safest method of spring application. Incorporate above the small grain seed.
- Use lowest labelled rate for both Far-Go and Trifluralin.
- Delay planting until soil warms-up and crop emergence will be quicker (not my first choice).
- Barley has better tolerance. If crop injury is a concern, use this combination on barley instead of wheat.
- Apply either Far-Go or Trifluralin, not both, then use a postemergence herbicide if needed.

If soil temperature increases and the crop emerges at a

normal rate, potential for crop injury decreases rapidly. If we soon see warmer temperatures, these issues will no longer be of concern. But if injury is a concern, look for its symptoms.

Far-Go/Treflan Injury Symptoms — Mode of action of Far-Go is the inhibition of cell division and elongation; mode of action of Treflan is inhibition of cell division and lateral root formation. Far-Go can also inhibit shoot growth. Far-Go/Treflan can cause elongation of the area between the seed and crown, production of distorted tillers at the seed node and the crown, delay in plant growth or emergence of leaves through the side of the coleoptile.

Small grain injury will be most pronounced on lighter textured soils due to less herbicide adsorption to soil particles. Injury in the field is usually spotty, with shallow or deep planted areas mostly likely affected.

Factors that can cause similar small grain injury symptoms include deep planting, soil compaction, soil crusting and wet soil/weather stress.

Beverly R. Durgan — Extension Weed Scientist

Postemergence Foxtail (pigeongrass) Control in Small Grains

Deciding whether to control foxtail in small grains is not always easy. Research from North Dakota State University and in Canada has shown that infestations will often not decrease wheat and barley yields. However, heavy infestations can cause harvest problems (especially when straight combining) and dockage when the grain is delivered to the elevator.

There are situations when the cost of a herbicide treatment for foxtail control is not justified. These include when infestations are light (fewer than 30 plants/ft²), and when the foxtail emerges after the crop is in the 3 to 4-leaf stage. Especially for barley, once the small grain is in that stage, it can usually out compete foxtail and make a herbicide treatment unnecessary. However, if the foxtail population is heavy (100 plants/ft² or more) control may be needed.

A complicating factor is moisture stress. Weeds generally cause greater yield losses under drought conditions, meaning foxtail control would be more important in droughty fields.

Deciding whether to apply a herbicide for foxtail control is more complicated when the foxtail is emerging with or shortly after the small grain; as is the case in many fields this year. Options to consider for foxtail control this year are:

- If infestation is heavy and emerging with the small grain,

consider harrowing or rotary hoeing **as soon as possible**.

- If a harrow or rotary hoe are not an option, then consider a herbicide. If wild oats are also in the field, choose Hoelon, Cheyenne and Tiller. Hoelon needs to be applied to small foxtail (1 to 3-leaf). If wild oats are not present, then Stampede CM or Stampede EDF can be considered.
- If infestation is light to moderate, it may be possible to wait to see if the crop will out compete foxtail. If foxtail is still a problem when the small grain is in the 5 to 6-leaf stage, then Tiller or Cheyenne can be used for control.

It is important to consider all methods of foxtail control. Harrowing or rotary hoeing can be an effective method of foxtail control if done when foxtail is just emerging. Once foxtail is in the 2 to 3-leaf stage, harrowing or rotary hoeing will not give effective control. Small grains can be harrowed or rotary hoed until the 3 to 4-leaf stage with little effect on yield.

Hoelon (diclofop) — Hoelon will control both foxtail and wild oats in hard red spring wheat, durum and barley. **DO NOT** apply Hoelon to oats. Hoelon can be applied at 2 to 2.67 pts/A when foxtail is in the 1 to 4-leaf stage. It will give the best control if applied to foxtail before the 3-leaf stage, especially when using the 2 pts/A rate. The higher labeled rates should

be used when foxtail has reached the 4-leaf stage.

When using the 2 pts/A rate of Hoelon in spring wheat or durum, the addition of 1 qt/A of crop oil concentrate increases foxtail control. **DO NOT** use crop oil concentrate on barley as severe crop injury may result.

Use caution applying Hoelon to barley under cool conditions, as crop injury can result. The label says not to apply it to barley if the daily minimum temperature reaches 40°F or less for three consecutive days before application. Hoelon should also be applied to barley **before tillering** to minimize injury.

Many broadleaf herbicides, when tank mixed with Hoelon, decrease the grass control of Hoelon. Hoelon can be mixed with Buctril (bromoxynil) or a low rate of MCPA ester (0.05 lbs/A) plus Buctril. **DO NOT** tank mix Hoelon with any other broadleaf herbicide.

Stampede CM Stampede EDF — Stampede CM is a package mix of Stampede (propanil) and MCPA ester. Stampede CM will control foxtails and some broadleaf weeds in barley, hard red spring wheat, and durum. It is also labelled for use in oats. Supplies of Stampede CM will be limited this year because Rohm and Haas has developed a new formulation.

Apply Stampede CM to foxtail in the 1 to 3-leaf stage and at the 2 to 5-leaf stage of hard red spring wheat or the 2 to 4-leaf stage of durum, oats, and barley. It is important to apply Stampede CM to small foxtail for effective control. The use rate of Stampede CM is 2.5 to 3 pts/A. Use 3 pts/A only when weed pressure is heavy or when weeds are growing under stress.

Many producers do not like to use Stampede CM because temporary yellowing of the crop usually occurs within three days of application. Research at the University of Minnesota has shown that this yellowing will not cause a yield loss. The crop will generally grow out of this injury within 10 days.

Stampede CM will also control common lambsquarters, redroot pigweed, wild buckwheat and wild mustard. **DO NOT** tank mix Stampede CM with any other herbicide.

Stampede CM and Stampede are currently the only herbicides labeled for foxtail control in oats.

Stampede EDF is a new formulation that will be used this year. EDF stands for extruded dry flowable. Stampede EDF can be tank mixed with MCPA ester for broadleaf control. The use rate is 1.25 lb/A of Stampede EDF and 0.5 pt/A of MCPA ester. This is equivalent to 2.5 pts/A of Stampede CM. A 25 pound bag of Stampede EDF will treat 20 acres. Cost of Stampede EDF should be similar to Stampede CM.

It is important to following mixing instructions for Stampede EDF. This formulation may not mix with water as readily as other dry flowables. Stampede EDF is also labeled for oats.

Tiller (fenoxaprop + MCPA ester + 2,4-D ester) — Tiller is labeled for postemergence foxtail control in hard red spring wheat. Use rate for Tiller is 1 pt/A for green foxtail control, 1.2 pts/A for yellow and green foxtail control, and 1.7 pts/A for fields with mixed populations of foxtail and wild oats.

Apply Tiller after the spring wheat begins to tiller (3-4 leaf stage) but prior to jointing stage (6-leaf stage). Tiller will control larger foxtail (3-leaf to 2-tillers) and can be applied later than other postemergence herbicides used for foxtail control in hard red spring wheat. In University of Minnesota research, Tiller has given good to excellent control of both yellow and green foxtail. **DO NOT** apply Tiller to durum wheat, barley, oats or rye. **DO NOT** apply more than one application of Tiller per season, or apply within 70 days of harvest.

Tiller can be tank mixed with some broadleaf herbicides for additional broadleaf weed control, however, it is important to carefully select the proper broadleaf herbicide. Many broadleaf herbicides, when tank mixed with Tiller will decrease the grass control of Tiller. It is important to read and follow all restrictions on the label.

For control of green foxtail, Tiller at 1 pt/A can be tank mixed with Banvel, Buctril, MCPA ester, Stinger, and Tordon. Tiller at 1.2 pts/A, for green foxtail control, can be tank mixed with Harmony Extra and Express. In fields with mixed populations of green and yellow foxtail, Tiller applied at 1.2 - 1.7 pts/A, can be tank mixed with Stinger, MCPA ester, Tordon, and Banvel. **DO NOT** apply Banvel after the 5-leaf stage.

There were several cases of hard red spring wheat injury due to Tiller applications in 1993. Injury was associated with cool, wet weather conditions and late applications. Spring wheat recovered without any evidence of yield loss. To decrease injury potential, **DO NOT** apply Tiller after jointing stage. Read the label for additional restrictions or precautions.

Cheyenne (fenoxaprop + MCPA ester + thifensulfuron + tribenuron) — Cheyenne is labeled for postemergence control of foxtails and wild oats and most annual broadleaf weeds in hard red spring wheat. Cheyenne is **NOT** labeled for use in durum wheat, barley or oats.

Apply Cheyenne to spring wheat from the 3-leaf stage to the end of tillering (6-leaf stage). **DO NOT** apply after jointing. Apply when grass weeds are 4 inches tall or less. **DO NOT** tank mix Cheyenne with any other herbicide, additive, or fertilizer. See the label for mixing instructions.

University of Minnesota research has shown that Cheyenne will give good to excellent control of wild oats, foxtails, kochia, common lambsquarters, pigweed and several other annual broadleaf weeds. **Cheyenne can NOT be applied by air.**

Beverly Durgan — Extension Agronomist, Weed Control

High Temperature Influence on Late Planted Wheat

Wheat is a cool season crop and does best when temperatures are cool during early stages of development and grain fill. Late planted wheat will often encounter warmer temperatures during tiller and spikelet formation. If tiller and spikelet numbers

are reduced, so too is potential grain yield.

Plant development rate in wheat is dependant on the number of growing degree days. Some individuals use 32°F as the minimum temperature while others use 40°F as the base to cal-

culate growing degree days for wheat. Temperatures above 95°F are also not used to calculate growing degree days.

Using 32°F as the minimum and 95°F as the maximum, Armand Bauer (USDA Soil Scientist, North Dakota) calculated daily growing degree days (GDD), [(daily maximum temp. + daily minimum temp.) ÷ 2], and found for medium maturity varieties it took 143 GDD to develop one leaf. The warmer the temperature, the faster leaves are developed, resulting in a shorter time for tiller development.

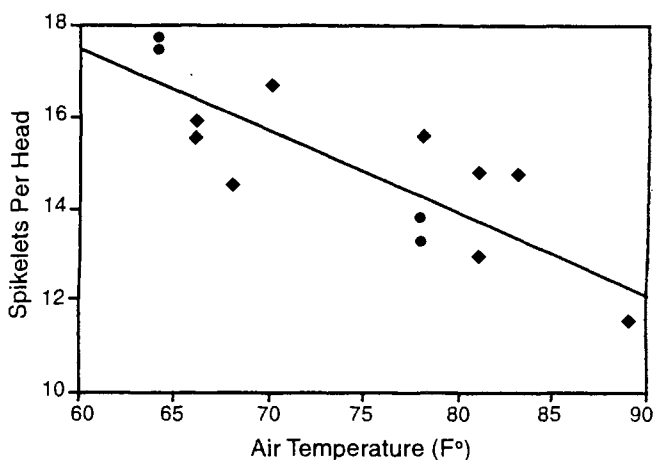
The number of spikelets, which determine the number of kernels, are determined during the 4 to 5.5 leaf stage (Haun or Feekes 14-15). At this stage, the spike (head) is clearing the soil surface and sensitive to high air temperatures. Average air temperature of 60°F during spikelet formation means the head will have 17 to 18 spikelets (Figure 1). If average air temperature is 90°F or above, the number of spikelets is reduced to 12, a 30 percent reduction that will be reflected in yield potential.

It takes 7-8 days to get through spikelet formation. If temperatures are in the 80s or 90s, this time period is compressed and doesn't allow maximum kernel number to develop. One day of high temperatures during this period may not reduce ultimate kernel number per head, but 3-4 days of high tem-

perature during this time will. Since tiller number and kernel number per head may be reduced by late planting, it is imperative that an adequate seeding rate be used when planting late.

Ervin Oelke — Extension Agronomist, Crops

Relationship between maximum daily air temperature during the 4 to 5.5 leaf stage and number of spikelets per head. (◆ = field data, ● = controlled environment studies).



DIAL U

Maple Bladder Gall — Galls are abnormal plant growths due to insect or mite feeding. Maple bladder galls are caused by eriophyid mites. This gall forms on the top of leaves of red and silver maples. The galls are yellow to red and are bead-like or bladder-like. An individual gall is small, about 1/16 to 1/8 inch diameter, with many on a single leaf. Later in the summer these galls turn black. Once galls are seen, it is too late for control. However, galls are rarely damaging and the problem is primarily cosmetic. (See *Plant Galls*, FS-1009)

Entomology Notes — Watch for yellowheaded spruce sawfly larvae. They should be beginning to hatch in central Minnesota. Ash plant bug have recently hatched. Expect to find damage on ash trees. Remember that ash plant bug damage is primarily cosmetic.

Jeffrey Hahn — Assistant Extension Entomologist

Ash Anthracnose — This has made its usual Memorial Day appearance. Leaflets began falling off highly susceptible green ash trees late last week and the disease continues to cause defoliation. Nothing can be done at this time. Fortunately, defoliation is not harmful to a healthy tree and routine fungicide application is not recommended.

Hollyhock Rust — This fungal disease can cause serious foliage loss. Severely rusted leaves turn yellow and wither. Check leaves, especially underneath, for yellow/orange progressing to brown pustules. Larger yellow spots with reddish centers develop on the leaf surface opposite the pustules. During wet conditions this disease spreads quickly and the entire plant can become infected.

Pick off and destroy infected leaves as soon as noticed. Water only at the base of the plant and avoid crowding plants. If necessary, a fungicide can be applied to protect healthy leaves from infection. Spray the entire aboveground portion of the plant at 7-10 day intervals. Registered fungicides include chlorothalonil, mancozeb and sulfur. Read the entire label before using. Remove infected stalks in autumn and destroy by burning, burying or composting.

Cynthia Ash — Assistant Plant Pathologist

Shade Trees Leafing Out Slowly and Sparsely — Many mature shade trees seem to be slow to leaf out this spring, or are only leafing out sparsely. Strangely enough, they're trees normally considered to be tough and hardy here; oaks, elms and ashes. Chances are, buds were lost when we went from a mild, "warm" March to a bone-chilling 8 or 9 degrees on April 5th. That hard frost, coming on the heels of temperatures that had plants beginning to come out of dormancy may have also frozen (and killed) some cambial tissue beneath the bark.

Only time will tell whether the trees will continue to leaf out as the season progresses, or whether they'll decline as wind and warm weather draw moisture more rapidly from their foliage. All you can do at this point is prevent moisture stress from adding insult to injury.

If we go a week or so without good rainfall, set soaker hoses or sprinklers in the grass a few feet from the tree trunk, out beyond the reach of its branches. Most of the feeder roots are in the upper 8 to 10 inches of soil, and can benefit from a good soaking every so often.

Deborah Brown — Extension Horticulturist

MINNESOTA EXTENSION SERVICE

UNIVERSITY OF MINNESOTA
COLLEGE OF AGRICULTURAL, FOOD,
AND ENVIRONMENTAL SCIENCES

Produced by the Educational Development System, Minnesota Extension Service.

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Crop Alternatives

U.S.D.A. has announced a sign-up period for two alternatives for CRP acres. Sign-up will be from May 15 to June 2, 1995 at County CFSA offices. The two alternatives are:

1. CRP contracts that expire on September 30, 1995 may be extended for one year until September 30, 1996. All provisions of the CRP contracts will remain the same.
2. Landowners may sign up to release all or part of existing CRP acreage prior to contract expiration. This is the so-called "early-out" option for CRP contracts.

Some Points to Consider on the "Early-Out" CRP Option:

- ✓ Sign-up is May 15 - June 2 at County CFSA offices.
- ✓ The date of release for CRP land can be any time from the date of CFSA approval until September 30, 1995.
- ✓ A farmer may plant a crop on released CRP acres in 1995.
- ✓ Crop bases that were lost at the time of CRP enrollment will not be added back until the 1996 growing season, so no deficiency payment can be earned on these acres. Also, no additional acres of program crops (corn, wheat, oats, barley) can be planted on released CRP acres, if the entire unit is in the 1995 Farm Program.
- ✓ CRP payments for 1995 will be pro-rated from October 1, 1994 until the date of CRP release. In May, landowners would receive 7 months of 1995 CRP payment, which will be paid in October, 1995.
- ✓ The following CRP acreage is not eligible for the "Early-Out" option:
 - * Field Windbreaks
 - * Grass Waterways
 - * Shallow Water Areas for Wildlife
 - * Vegetative Filter Strips
 - * Shelterbelts
 - * Bottomland Timber on Wetlands
 - * Practices on which a Useful Life Easement is Filed

- * Land within 100 feet of a River, Stream, or other Permanent Waterbody.
- ✓ Much of the existing CRP land is categorized as "highly erodible" and will require conservation-type farming practices with stringent tillage and crop rotation requirements during the remaining years of the 10-year CRP contract.
- ✓ Landowners should contact their County CFSA office regarding details on the early release of CRP acres.
- ✓ Producers should contact their County NRCS office for farming practices that will be required on released CRP acres.
- ✓ If you have any questions about this, feel free to call Kent Thiesse (504-389-8141).

*Kent Thiesse
Blue Earth County Extension Educator*

Highlights...May 26, 1995

*CRP Alternatives
New Futures and Options
Postemergence Wild Oat Control In Small Grains
New Assert Formulation in 1995
Update on Herbicide Resistant Weeds in MN
Alfalfa
Corn/Soybean Stands
Alfalfa Weevil and Potato Leafhopper
European Corn Borer
Vegetables - Aster Leafhopper
Cutworm Activity Increasing But No Black Cutworms Yet
Dial U
Bacterial Blight
Slugs In The Garden
Using Borax To Control Creeping Charlie*

New Futures and Options

Iowa Corn Yield Insurance (CYI) Futures and Options contracts will be available on June 2, 1995, at the Chicago Board of Trade (CBOT). The new Futures and Options contracts will allow a person to hedge against low corn yields several months before harvest.

Iowa Corn Yield Futures and Options are very similar to other CBOT contracts, including margin calls and Option premiums. Trading is based on the state average corn yield for Iowa. Your "Basis" is your expected corn yield relative to the average Iowa yield.

Iowa Corn Yield Futures and Options, are not only new, but are rather complex. Producers that are interested in these new contracts should get more information and do some calculations on how the contracts might be used as risk management tools.

The Minnesota Extension Service has prepared an information sheet entitled: **IOWA CORN YIELD INSURANCE FUTURES AND OPTIONS**. Call the Blue Earth County Extension Office for a free copy (507-389-8325).

*Kent Thiesse
Blue Earth County Extension Educator*

Postemergence Wild Oat Control in Small Grains

This spring has been a challenge, to say the least, for everyone except maybe for the weeds! Many small grain fields have just been seeded, some are yet to be seeded, and some are ready for postemergence herbicide applications. Timing herbicides application this year will be more difficult than in the past.

In fields that were seeded earlier, the wild oats are up and growing! Wild oat spraying has begun in the southern end of the valley, and will start in the northern part of the valley by the weekend. Due to the cool, wet conditions this spring, there is heavy wild oat pressure in many fields (similar to last year).

However, there is some good news about the delay in seeding. The delayed seeding in some fields has allowed the first flush of wild oats to emergence, and tillage before planting has destroyed them. Therefore, we should expect to see lower populations of wild oats in these later planted fields. However, these fields will still need to be scouted since wild oat population still could be high enough to cause yield losses.

There are several postemergence herbicides available for wild oat control in spring wheat and barley. Each herbicide has advantages and disadvantages. In this article I will try to compare and contrast these herbicides.

Good wild oat control with any herbicide requires proper timing of applications. Postemergence wild oat herbicides require application to wild oats and crops at precise leaf stages. Leaf number on wild oats is determined by counting the leaves on the main stem and disregarding the tillers. The youngest leaf is counted as a full leaf only when another leaf becomes visible. Lower leaves which may have died from various stresses, such as frost or wind damage, should also be counted in the total leaf number. An accurate leaf count is important for optimum wild oat control.

Climatic conditions must also be considered when choosing a wild oat herbicide. One advantage of these cool, wet conditions is that the wild oats are growing well and are not under any stress. Therefore, the postemergence wild oat herbicides should give good control.

There are a number of tradeoffs for the advantages any one postemergence wild oat herbicide might offer. Early

wild oat control can mean better yields because the weed has less time to compete with the crop. However, when a herbicide treatment is applied early, odds are greater that a late flush of wild oats will require a second herbicide application or that some wild oats might escape treatment. Uncontrolled wild oats can reduce yields and will produce seed that contribute to next year's wild oat problem. In general, under heavy wild oat pressure (over 20 plants/square foot), research has shown that a herbicide treatment should be applied as soon as possible to prevent high yield losses.

Postemergence wild oat herbicides currently labeled in Minnesota are summarized below.

Assert (imazethabenz): Assert is labeled for wild oat control in spring wheat, durum, and barley. Assert will also control plants in the mustard family, including wild mustard.

Research on wild oat control with Assert has been conducted at the University of Minnesota since 1982. In these trials Assert has given consistent wild oat control. Spring wheat, durum and barley have good tolerance to Assert.

The use rate of Assert is 1.0 to 1.2 pt/A. For best control, apply Assert when wild oats are in the 1- to 4-leaf stage. Good wild oat control has been obtained when the 1.0 pt/A rates have been applied to 1- to 3-leaf wild oats; however, for larger wild oats, the 1.2 pt/A rate should be used. **The Assert formulation was changed in 1993, and now Assert must always be applied with a non-ionic surfactant at a rate of 2 pts of surfactant per 100 gallons of spray solution.** For control under adverse conditions, such as dry conditions or heavy wild oat pressure, Assert should be applied with a **crop oil concentrate at 2 pt/A in addition to the surfactant.** Do Not apply crop oil concentrate with 2,4-D ester because of the potential for crop injury.

Assert will also be available this spring as a 67% SG formulation. The use rate for the Assert SG is 7.5 to 11.2 oz/A. The 7.5 oz/A rates is equivalent to the 1 pt/A rate of the liquid and 9 oz/A is equivalent to the 1.2 pt/A of the liquid formulation. One container of Assert SG contains enough material for 24 acres at the 1 pt/A rate of the liquid formulation, or 20 acres at the 1.2 pt/A.

Adjuvant selection is very important when using As-

sert SG. Failure to use the proper adjuvant can result in unacceptable wild oat control (less than 50%). Assert SG should **ALWAYS** be applied with a good quality non-ionic surfactant with at least 80% active ingredient at a rate of 2 pints per 100 gallons of spray solution. For control under adverse conditions, such as dry conditions or heavy wild oat pressure, Assert should be applied with a **crop oil concentrate at 2 pt/A in addition to the surfactant**. SUN-IT II may be used instead of a non-ionic surfactant or instead of a non-ionic surfactant plus crop oil. The rate for SUN-IT II is 1.5 to 2 pt/A. When tank mixing Assert SG with 2,4-D ester **Do Not** add crop oil concentrate or SUNIT-II because of the potential for crop injury.

Assert and Assert SG can be tank mixed with 2,4-D ester, MCPA ester, Bronate (bromoxynil + MCPA ester), Harmony Extra (tribenuron + thifensulfuron). **Do Not** tank mix with Banvel (dicamba), MCPA amine, or 2,4-D amine as reduced wild oat control will result.

Assert and Assert SG have soil activity, and may persist for more than one year in the soil; therefore, do not plant any crop other than barley, wheat, corn, sunflowers, soybeans or edible beans for at least 15 months after an Assert application. Do not plant sugarbeets for at least 20 months following an Assert application. **Do Not** plant oats, canola, or alfalfa for 15 months after an Assert application.

Avenge (difenzoquat): Avenge can be used for wild oat control in spring wheat, durum and barley. Barley has good tolerance to Avenge. However some spring wheat and durum varieties will be injured by Avenge. Many new hard red spring wheat varieties were added to the Avenge label last year, however there are still several newer varieties not listed. One variety in particular that is not on the regular Avenge label is 2375. However, there is a supplemental label that allows Avenge to be applied to 2375 at 2 1/2 to 3 pts/A. 2375 was planted on a large number of acres this year, however serious injury may result if Avenge is applied at rates greater than 3 pts/A. See the label for a complete list of hard red spring and durum wheat varieties that have tolerance to Avenge. Common hard red spring wheat varieties that are **Not** on the Avenge label include Sharp, Grandin, and Gus.

Avenge should be applied when the majority of wild oats are in the 3- to 5-leaf stage. In Minnesota research trials, Avenge gave the best control when wild oats were in the 4- to 5-leaf stage. Avenge should be applied at the highest labeled rate when applied to heavy infestations of 3-leaf wild oats and should not be applied until the wild oats have reached the 3-leaf stage. Use rate for Avenge is 2.5 to 4 pts/A.

Avenge can be tank mixed with 2,4-D, MCPA, Harmony Extra (tribenuron + thifensulfuron), Express (tribenuron), Buctril (bromoxynil), Curtail (clopyralid + 2,4-D amine), and Bronate (bromoxynil + MCPA ester). **Do Not** tank mix Avenge with Banvel (dicamba).

Avenge has given consistent wild oat control in the University of Minnesota research trial.

Carbyne (barban): Carbyne was one of the first herbicides available for wild oat control in small grains. There still may be limited supplies of Carbyne available in 1995. To obtain good wild oat control with Carbyne, it must be applied when wild oats are in the 1.5- to 2-leaf stage. This usually occurs between 4 to 9 days after wild oat emergence. Carbyne can be applied at any crop stage to all varieties of wheat and barley. Carbyne should not be mixed with, or applied within four days of, any other herbicide. Use rate for Carbyne is 1 to 1.5 pts/A (0.25 to 0.38 lb/A).

To reduce possible crop injury, Carbyne should be applied when daytime temperatures will exceed 50° F for at least several hours of each of the first three days following treatment. Carbyne is different from most herbicides in that crop injury and wild oat control are greater at lower than at high temperatures. This is an important consideration this year because of the cool temperatures so far this spring. Nozzle type, sprayer pressure and proper carrier gallonage are also critical factors when using Carbyne.

Dense vigorous crop stands help suppress wild oats and enhance the control obtained with Carbyne. Therefore, wild oat control may be unsatisfactory in thin crop stands. Research has shown that Carbyne will give the best control when applied to low or medium wild oat infestation. Carbyne will generally not give satisfactory control when applied to heavy wild oat infestations.

Cheyenne (fenoxaprop + MCPA ester + thifensulfuron + tribenuron): Cheyenne is labeled for postemergence control of foxtails and wild oats and most annual broadleaf weeds in hard red spring wheat. Cheyenne is **NOT** labeled for use in durum wheat, barley or oats. Apply Cheyenne to spring wheat from the 3-leaf stage to the end of tillering (6-leaf stage). **Do Not** apply after jointing. Apply when grass weeds are 4 inches tall or less. **Do Not** tank mix Cheyenne with any other herbicide, additive, or fertilizer.

See the label for mixing instructions. Research at the University of Minnesota has shown that Cheyenne will give good to excellent control of wild oats, foxtails, kochia, common lambsquarters, pigweed and several other annual broadleaf weeds. **Cheyenne Cannot be applied by air.**

There were several cases of hard red spring wheat injury due to Cheyenne applications reported last year. The injury is associated with cool, wet weather conditions and late applications. In most cases, the spring wheat recovered from this injury and there was no yield loss. To decrease the crop injury potential, **do not** apply Cheyenne after jointing stage. Read the label for additional restrictions or precautions.

Wild Oat Control/Continued

Hoelon (diclofop): Hoelon can be applied to all varieties of wheat, barley and durum. Hoelon should be applied when wild oats are in the 1- to 4-leaf stage. For best control, research has shown that Hoelon should be applied before the 3-leaf stage, especially when using the 2 pt/A rate. Hoelon can be applied at 2 to 3.3 pts/A (0.75 to 1.25 lb/A) in spring wheat and durum, and 2 to 2.67 pts/A (0.75 to 1.0 lb/a) in barley. **Do Not** use over 2.67 pts/A in barley, as barley injury will result.

When using the 2 pt/A rate of Hoelon in spring wheat and durum, the addition of 1 qt/A of crop oil concentrate has been shown to increase wild oat control. **DoNot** use crop oil concentrate on barley. When wild oat plants have reached the 3- to 4-leaf stage and/or plants are under moisture stress, the higher labeled rates should be used. Wild oat control with Hoelon is increased by cool temperatures following application.

Wild oat control with Hoelon will be reduced when wild oats are growing under moisture stress. Increasing the rate used can somewhat overcome this problem.

Caution should be used before applying Hoelon to barley under the environmental conditions we have had this spring. Hoelon has the potential to give severe barley injury under cool, wet conditions. The Hoelon label says not to apply Hoelon to barley if daily minimum temperatures reach 40°F or less for three consecutive days before application. Also, do not apply when moisture content of the field is at field capacity. Hoelon should also be applied to barley before tillering.

It is important to carefully select the proper broadleaf herbicide to tank mix with Hoelon. Many broadleaf herbicides, when tank mixed with Hoelon, decrease the grass control of Hoelon. Hoelon can be tank mixed with Buctril (bromoxynil) or a low rate of MCPA ester (0.05 lb/A) plus Buctril. **Do Not** tank mix Hoelon with Harmony Extra because decreased wild oat control will occur. **Do Not** tank mix Hoelon with any other broadleaf herbicide. If a broadleaf herbicide is used, separate the Hoelon treatment and the broadleaf treatment by a minimum of 5 days.

Tiller (fenoxaprop + MCPA ester + 2,4-D ester): Apply Tiller at 1.7 pts/A after the spring wheat begins to tiller (3-4-leaf stage) but prior to jointing stage (6-leaf stage) for wild oat control. Tiller will also control larger foxtail (3-leaf to 2-tillers). In University of Minnesota research, Tiller has given good to excellent control of both yellow and green foxtail. **DoNot** apply Tiller to durum wheat, barley, oats or rye. **DoNot** apply more than one application of Tiller per season, or apply within 70 days of harvest. Tiller can be applied by air.

Tiller at 1.7 pts/A is labeled for tank mixing with Stinger, Buctril and Tordon for wild oat control. Check the label for tank mixing restrictions.

There were several cases of hard red spring wheat injury due to Tiller applications in 1993. The injury was associated with cool, wet weather conditions and late applications. In most cases, the spring wheat recovered from this injury and there was no yield loss. To decrease the crop injury potential, **DoNot** apply Tiller after jointing stage. Read the label for additional restrictions or precautions.

*Beverly R. Durgan
Extension Weed Scientist*

New Assert Formulation in 1995

Assert will be available in limited supplies this spring as a 67% SG formulation. Rates for Assert SG are 7.5 to 11.2 oz/A. The 7.5 oz/A rate is equivalent to the 1 pt/A rate of the liquid and 9 oz/A is equivalent to the 1.2 pt/A of the liquid formulation. One container of Assert SG contains enough material for 24 acres at the 1 pt/A rate of the liquid formulation or 20 acres at the 1.2 pt/A of the liquid formulation.

Adjuvant selection is very important when using Assert SG. Failure to use the proper adjuvant can result in unacceptable wild oat control (less than 50%). Assert SG should **ALWAYS** be applied with a good quality non-ionic surfactant with at least 80% active ingredient at a rate of 2 pints per 100 gallons of spray solution. For control under adverse conditions, such as dry conditions or heavy wild oat pressure, Assert SG should be applied with a **crop oil concentrate at 2 pt/A in addition to the surfactant.** SUN-IT II may be used instead of a non-ionic surfactant or instead of a non-ionic surfactant plus crop oil. The rate for SUN-IT II is 1.5 to 2 pt/A. When tank mixing Assert SG

with 2,4-D ester, **Do Not** add crop oil concentrate or SUN-IT II because of the potential for crop injury.

Assert SG can be tank mixed with 2,4-D ester, MCPA ester, Bronate (bromoxynil + MCPA ester), Harmony Extra (tribenuron + thifensulfuron). **Do Not** tank mix with Banvel (dicamba), MCPA amine, or 2,4-D amine as reduced wild oat control will result.

Assert SG has soil activity, and may persist for more than one year in the soil; therefore, do not plant any crop other than barley, wheat, corn, sunflowers, soybeans or edible beans for at least 15 months after an Assert SG application. **Do Not** plant sugarbeets for at least 20 months following an Assert application. **Do Not** plant oats, canola, or alfalfa for 15 months after an Assert SG application.

University of Minnesota research has shown that Assert SG, when applied with the proper adjuvants, gives similar wild oat control compared to the liquid formulation of Assert.

*Beverly R. Durgan
Extension Weed Scientist*

Update on Herbicide Resistant Weeds in Minnesota

Herbicide resistant weeds continue to be a growing problem in the United State. In Minnesota since the mid 1980s, six weed species have developed resistance to three different classes of herbicides. Two of these weed species have just recently been identified.

Recently a Pursuit (imazethapyr) resistance biotype of cocklebur and kochia has been identified in Minnesota. The Pursuit resistant cocklebur has been confirmed in 2 counties and the Pursuit resistant kochia has been confirmed in one county.

Since many of the herbicides that have recently been labeled have the same or similar modes of action as Pursuit, there is a growing need for every grower to develop a weed control program to prevent the further development of herbicide resistant weeds.

The following is an update on the resistant weed species identified to date in Minnesota:

Triazine Resistant Lambsquarters, Pigweed and Velvetleaf: The first family of herbicides to which weeds developed resistance in Minnesota was the triazine herbicides. The triazine herbicide family includes such herbicides as atrazine, Bladex, Princep, and Sencor/Lexone. Triazine resistant common lambsquarters has been identified in 14 counties in the central and southeastern part of the state. Triazine resistance redroot pigweed and velvetleaf have been identified in 1 county in central Minnesota. These resistance biotypes have not increase dramatically in the last few years because of the decreased use of high rates of atrazine.

Hoelon (diclofop) and Fenoxaprop Resistant Wild Oats: Hoelon and fenoxaprop resistant wild oats are found in the Red River Valley of Minnesota and North Dakota. Development of this resistance can be attributed to extensive use of Hoelon or fenoxaprop premix products, Tiller and Cheyenne, for wild oat control in small grains and yearly single and/or multiple applications of Poast (sethoxydim) in sugarbeet. This wild oat biotype has been identified in over 40 fields.

Pursuit (imazethapyr) Resistant Cocklebur: Pursuit resistant cocklebur has been identified in 2 counties, one biotype is located in the west, and the other biotype is located in central Minnesota. Development of this resistance can be attributed to repeated use of Pursuit in continuous soybeans. This resistance has developed quickly, after only 4 to 5 years of Pursuit use.

Pursuit (imazethapyr) Resistant Kochia: A kochia bio-

type that is resistant to Pursuit and Harmony Extra has been identified in one county in western Minnesota. Development of this resistance can be attributed to repeated use of Pursuit in soybeans and Harmony Extra and/or Harmony in wheat. This resistance has also developed quickly, after only 4 years of Pursuit or Harmony/Harmony Extra applications.

Strategies To Prevent The Development of Herbicide Resistant Weeds

1. Use herbicides only when necessary.
2. Practice crop rotation. This will help to avoid or delay the buildup of resistant weeds. It also has many other beneficial effects on crop production.
3. Use integrated weed control practices. Integrate the best combinations of cultural, mechanical, and chemical weed control methods. In other words, do not rely solely on herbicides to control weeds.
4. Rotate herbicides. **Do Not** use the same herbicide, or herbicides with the same mode of action repeatedly.
5. Tank-mix herbicides with different modes of action.
6. Use short residual herbicides in preference to long residual herbicides.
7. If resistant weeds do appear, avoid spreading the seeds in silage, grain or hay. Clean all tillage and harvesting equipment after leaving the problem field.

If you suspect that a field may have an herbicide resistant weed, here are some questions you can ask to help make the determination.

When To Suspect Herbicide Resistance

1. Same herbicide (or herbicides with the same mode of action) have been used on the field for several seasons.
2. Past performance of the herbicide has been very good.
3. Herbicide performance is poor on just 1 or 2 weed species, but good on others.
4. Other reasons for poor performance have been eliminated.

In summary, the number of weeds developing resistance to herbicides is likely to increase in the future. It is important to manage the use of herbicides to prevent this resistance; and it is also important to be able to recognize and correct the problem once it exists.

*Beverly R. Durgan and Jeffrey L. Gunsolus
Extension Weed Scientists*

Alfalfa

Winter injury was the main topic for many alfalfa growers this season. While several have reported on this situation the samples I've seen mostly reflect damage from ice/freezing of the top 3 to 4 inches of the crown and root tissue. The samples for the most part were soft and still white which indicates the damage was ice formation and not decay or rot problems. Growers reported that damage was greatest in stands that were older, which again is suggestive of ice damage.

The older stands should be monitored for stem and leaf diseases also. The older stands usually have higher levels of disease inoculum and with the expectation of cool wet

weather, spring black stem and other foliar diseases can quickly reduce the quality by leaf drop. Small black spots on leaves (and petioles and stems) become irregular in shape and merge until much of the leaf is covered. Such leaves yellow and fall from the plant. When spring black stem is severe up to 2/3 of the leaves can be lost before harvest. Stem lesions also become black, enlarge to girdle the stem, killing the plant. Harvest date should be determined by scouting and with an eye on the weather forecasts, don't delay cut or leaf loss will reduce yield.

Ward C. Stienstra
Extension Plant Pathologist

Corn/Soybean Stands

Heavy rain fall, soil crusting and cool temperatures are favorable for damping off diseases. Pre- or postemergence death can result. Corn plants are usually easier to find, while soybean seedlings often rot completely away. If you suspect a problem, dig and look now. Check for seed decay, discolored-brown or rot-mushy roots. Seedling leaves are

usually smaller and pale in color. Symptoms are generally worse in low sites, but also watch for other factors like herbicide injury, insecticide damage, fertilizer burn and soil/seed placement failures (depth and crusting of soil).

Ward C. Stienstra
Extension Plant Pathologist

Alfalfa Weevil and Potato Leafhopper

To date, only minimal weevil infestations have been detected at Rosemount (1-2 larvae/100 sweeps). Degree-days are also accumulating at a slow rate, ranging from 171 at Alexandria to 266 at Rosemount and 255 at Waseca. Again, we need 300-400 before significant early instar larvae will be detected. In the meantime the alfalfa is moving along, and I

anticipate first harvest should again occur during the first week of June — before weevil larvae do much damage to the first crop.

We have still not detected any potato leafhopper at Rosemount (in 500 sweeps on 5/24/95).

Bill Hutchison
Extension Entomologist

European Corn Borer

Degree-days for ECB are accumulating slowly, ranging from 131 at Alexandria to 205 at Waseca. We usually do not see the first flight begin until 400 DDs. All cooperators monitoring light or pheromone traps this summer should have

them in place by May 31 in the south and June 7th in the north to be sure to catch the beginning of the flight.

Bill Hutchison
Extension Entomologist

Vegetables — Aster Leafhopper

We are finding increasing numbers of ALH in alfalfa at Rosemount (beginning last week on 5/17/95). Counts this week were up to 38/100 sweeps, which are higher than has been reported in Wisconsin, to date. Carrot and lettuce growers should be checking their fields closely, using a standard 15" diameter sweep net. I will have more in next weeks

newsletter. In the meantime check the BU-1880 publication, *Commercial Vegetable Pest Management Guide* for 1995 for thresholds and insecticide recommendations.

Bill Hutchison
Extension Entomologist

Cutworm Activity Increasing but No Black Cutworms Yet

Despite the rain of last weekend, black cutworm captures remain low. In areas of Minnesota where planting has been delayed, black cutworms could still pose a problem if a major weather system dumps them on our doorstep. We'll keep you posted. My thanks to the 85 cooperators who monitored traps this spring without the excitement of seeing 8-16 moths in a trap.

Meanwhile, native cutworms that overwinter here are starting to make their presence known. Lyle Marcus, Keljten Seed, reports one field near Little Falls that suffered 75-85% stand loss in sunflower from a suspected dingy cutworm infestation. Chuck Wilmes, Dill Co. - Janesville, reports 5% leaf feeding with some cutting activity on corn.

Ken Ostlie
Extension Entomologist

Dial U

Bacterial Blight — Bacterial blight is showing up on lilacs (especially white), forsythia and mock orange in nursery and landscape settings. The causal agent, *Pseudomonas syringae* pv. *syringae*, is an unspecialized bacterial pathogen that attacks many plants. The first symptoms are irregular to circular black spots with yellowish halos on leaves. Spots may coalesce and entire leaves shrivel and die. Petioles or succulent stems with girdling lesions droop and the leaves or shoots distal to lesions wither. Flower buds are killed by early-season infections.

Remove blighted twigs as soon as they occur, using a sterile pruning techniques, i.e. dip the shears for 10-20 seconds in a fresh 10 percent bleach solution between cuts (one part household bleach to 9 parts cold water). Remove the blighted areas at least 3-4 inches into healthy appearing tissue during dry weather and water only at the base of the plant. If bacterial blight is an annual problem for you, consider two to three applications of a copper fungicide, such as Bordeaux mixture, beginning when the new growth appears next year.

Cynthia Ash
Assistant Plant Pathologist

Slugs In The Garden — Our cool, wet spring has encouraged slugs in home gardens. Sanitation, picking up boards, stones, old plant material, and other debris, is important to reduce slug numbers. You can trap slugs by sinking pans or wide-mouthed cups or jars into the ground and filling them with beer or a water and yeast mixture. Be sure to regularly empty the containers. You can also trap slugs by placing a few damp newspapers or boards in the garden, and removing slugs that hide under them in the morning. The use of metaldehyde, a pesticide bait, is also an option. However metaldehyde is less effective during cool, wet weather when slugs are most common.

Jeffrey Hahn
Assistant Extension Entomologist

Using Borax To Control Creeping Charlie — Research at Iowa State University has shown promising results using borax to control creeping charlie in the lawn. A lot of information has dribbled out about the efficacy of the borax treatment, so much that they have made a "recommendation", or really, a "suggestion" on how people who are curious can try it in their own yards.

The formula is five teaspoons of borax (20 Mule Team Borax is fine) dissolved in one quart of water and sprayed evenly over twenty-five square feet of lawn. To make sure your sprayer is delivering the right amount of borax, fill it first with one quart of water and "practice" spraying evenly over a five by five foot patch of grass in another part of the lawn. (Use a hand-held sprayer.)

Apply the borax solution once, in late May or June, when creeping charlie leaves are fully expanded, then examine the area in autumn to see how effective it's been. You should not repeat the spray, as boron builds up in the soil and can kill the grass and make it impossible to re-plant.

Boron will kill any vegetation if it's applied in heavy enough dosages. The reason you can try it on creeping charlie is that this particular weed is actually more sensitive to the presence of boron than turfgrasses are. You may see a little browning on the grass even when you use the correct formula, but the grass should grow out of it.

Borax should only be used where the creeping charlie is intermingled with decent-looking grass that you wish to spare. If you have large patches of the weed, you can kill them easily with glyphosate (Round UP), then start over with seed or sod.

Don't use borax in gardens or where grass is young and not well-established. We do not have information on its efficacy on other lawn weeds, either, so don't generalize from creeping charlie to dandelions, plantain and other pesky plants.

Deborah Brown
Extension Horticulturist

MINNESOTA EXTENSION SERVICE

UNIVERSITY OF MINNESOTA
COLLEGE OF AGRICULTURAL, FOOD,
AND ENVIRONMENTAL SCIENCES

Produced by the Educational Development System, Minnesota Extension Service.

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CROP

NEWS

From the
Crops System Team
of the
Minnesota Extension Service

Using Zinc in Minnesota

In Minnesota, the importance of zinc (Zn) for crop production has been recognized for nearly 30 years. Zinc is classified as a micronutrient because only small amounts are used by crops. Some important points about Zn use in Minnesota are summarized in the following paragraphs.

The Crop — Zinc is not needed in a fertilizer program for all agronomic crops in Minnesota. To date, corn and edible beans are the only agronomic crops that have responded to the use of zinc in a fertilizer program.

The Soil — Zinc will not be needed in a fertilizer program for all soils in Minnesota. The need for Zn is possible where the pH is 7.3 or higher or where soils are sandy with a very low organic matter content. Research in other states has indicated that the use of excessively high rates of phosphate fertilizer or the existence of very high levels of phosphorus in soils will create a need for Zn in a fertilizer program. In Minnesota, there is a very low probability that a Zn deficiency will be created by either the rates of phosphate used or the soil test P levels found in the large majority of soils. The application of phosphate to soils does not automatically mean the Zn must be added to the fertilizer program. Use the soil test for Zn to determine Zn needs.

The Soil Test for Zinc — The Zn status of Minnesota soils is easily measured by a routine soil testing procedure. Relative Zn levels and associated recommendations for Zn use are summarized in the following table.

Soil Test Value for Zn ppm	Relative Level	Amount to Apply for Corn	
		Row	or Broadcast
		----- lb/acre -----	
less than 0.5	low	2	10-15
0.5 to 1.0	marginal	1	5-10
more than 1.0	adequate	0	0

The broadcast recommendations listed in this table should correct a Zn deficiency for 4 to 6 years. Since soybeans have not responded to Zn in research trials, the use of Zn in a starter fertilizer for the corn crop would be the best choice in a corn-soybean rotation. If there is some doubt about a need for Zn, the soil test is the most reliable method of establishing the Zn level of a soil.

Zinc Sources — There are several sources that can be used to supply Zn when soil tests show that it is needed. Research shows that all Zn sources have an equal effect on yield when applied in a starter fertilizer. Cost will vary widely with source; so, price per pound of Zn applied should be a major consideration when selecting a source of Zn to use. See FS-0720, *Zinc for Minnesota Soils*, for more detailed information on Zn.

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Tillage and Fertilizer Options for 1995 Spring Wheat Planting

This unusual, extended stretch of cold, wet weather has raised several questions about tillage and fertilizer management practices that can be used for the 1995 spring wheat crop. There are no research studies which are specifically designed for the planting conditions that we have this year. So, advice comes from general concepts that we've learned over the years tempered with a generous amount of common sense. A few general guidelines are outlined below.

Tillage: The major concern, of course, is **compaction**. We can't afford to wait until soil conditions are perfect for planting. So, keep the number of trips over the field to a minimum. If possible, combine operations such as fertilizer application and tillage. Avoid using a disk. The disk can cause major compaction when used on soils that have a high clay content.

Nitrogen Source: If nitrogen fertilizer has not been applied, plan to use urea in 1995. There are several reasons for this suggestion. It may be very difficult to get a good seal if anhydrous ammonia is applied to the very wet soils. The nurse tank can cause substantial compaction. Urea can be applied more rapidly allowing a coverage of more acres in a shorter period of time.

Don't delay planting to wait for N application. Urea can be broadcast on the soil surface after planting, but before emergence. There may be a small amount of nitrogen loss. But soil temperatures are still cool and this should keep nitrogen loss from urea to a minimum. Rain will incorporate topdressed urea. There is a high probability that this will happen.

Banded Phosphate: Use of banded phosphate has always been a good practice for small grain production. This practice is especially important when soils are cold and wet (1995). Application of 18-46-0 with the drill at planting time is still a good management practice.

Denitrification: There may be some concern that nitrogen applied last fall has been lost. This is not likely. Loss from denitrification requires warm soil temperatures — something that we haven't seen in the spring of 1995.

Special Products: There are **no** products or additives that will enhance or speed up movement of water through excessively wet soils. You can anticipate that someone will be selling something to make soils dry out faster. These claims might sound good; there's no substitute for a sunny, windy day.

Plant Disease Clinic Report

Numerous floriculture crops were submitted to the clinic this spring for ELISA testing for Tomato spotted wilt virus (TSWV) and Impatiens necrotic spot virus (INSV). Of the samples submitted the following were positive for INSV:

African violet, Browallia, Gloxinia, Cineraria, petunia and impatiens (New Guinea and double).

Geraniums were also submitted for ELISA testing for *Xanthomonas campestris* pv *pelargonii* (bacterial wilt).

Other hosts and diseases observed this spring are listed below:

Rose — Downy mildew

Viola — *Cercospora* sp. leaf spot
Gerbera — *Colletotrichum* sp. leaf spot
Tulip — *Botrytis* sp. bulb rot
Diffenbachia — *Pythium* sp. stem rot
E. ivy — bacterial leaf spot
Maple — *Verticillium dahliae*
Pine — *Dothistroma* sp. needlecast
Spruce — *Rhizosphaeria* sp. needlecast
Soybean seed — Downy mildew, *Phomopsis* sp.
Turf — winter and ice damage, no diseases observed
Silage and haylage — storage molds
Wheat — scab testing

Sandra Gould
Extension Assistant Scientist

Alfalfa

Alfalfa Weevil & Potato Leafhopper — Degree days (>48°F) are still lagging behind normal for weevils, ranging from 112 in Alexandria to 180 at Waseca. As suggested by the degree-day models, weevil activity has not yet been detected at Rosemount. Potato leafhoppers have also not yet been detected. Five fields at Rosemount were checked May 17th (100 sweeps/field), and no PLH were found. The prime time for PLH movement into the state is approx. May 15th to June 15th, generally building up on the second crop. I will have more about PLH in future newsletter issues.

Bill Hutchison
Extension Entomologist

Corn

European Corn Borer — Degree days for ECB (base threshold = 50°F) continue to slowly accumulate across the state, ranging from 83 at Alexandria to 140 at Rosemount and Waseca (as of May 16th). In 7 of the past 11 years, the first ECB flight has begun during the week of May 22nd (approx. 400 DDs); this year, it will probably not begin until the end of May or early June (if temps remain cool). Peak first flight is at approx. 600 DDs. More details will be given in future issues.

Bill Hutchison
Extension Entomologist

Soybean

Help with Soybean Insects and Mites: Think back....way back. When was the last time insect infestations in soybeans were worth treating? For many of us, the 1988 and 1989 outbreaks of two-spotted spider mites or grasshoppers spring to mind. For others, it might be geographically isolated infestations of bean leaf beetle, green cloverworm, yellow wooly bear or seedcorn maggots of the past few years. Will we see insect problems this season? Good question! Insect problems in Minnesota soybeans are generally sporadic and spotty with most growers not seeing insect infestations worth treating over a 10-year period.

The scarcity of insect problems in soybean can be both a blessing and a curse. On one hand, the lack of key insect pests means lower production costs. On the other hand, problems with low frequency are more difficult to manage effectively for both soybean producers and the ag professionals who advise them. We're more likely to be caught by surprise because pest infestations don't warrant regular scouting ef-

fort and we're rusty on making management decisions when the need arises only once every ten to twenty years.

If you're concerned about identifying soybean insects and want the latest management information, check out the *Handbook of Soybean Insect Pests*. This new color publication from the Entomological Society of America provides exceptional photos, easy-to-use diagnostic keys on insects and soybean injury, life cycle information and management tips. *Handbook of Soybean Insect Pests* can be ordered for \$30 plus \$2.50 shipping and handling by:

Mail: ESA Sales, 9301 Annapolis Rd., Lanham, MD 20706

Phone: (301) 731-4535 (VISA/MASTERCARD accepted)

Fax: (301) 731-4538.

Order a copy soon so you have it in time for soybean emergence.

Ken Ostlie
Extension Entomologist

Bee-Here

In the last issue of the Sunflower magazine there was a full page ad about the bee attractant Bee-Here. It has a pheromone like attractor for worker honey bees. There is a fair amount of recent research from the Pacific northwest which would suggest there may be some increase in bee visitation in fruit when treated with the product. However, the supporting data for bee-visitiation and yield for sunflower was developed in Argentina.

I have written for the methodology of how the Argentine work was done and have asked Troy Bioscience for some product to experiment with here. Until we do that I would not recommend Bee-Here for use in this region.

Remember that we have hard data which suggests 400 lbs of a 2000 lb yield in current sunflower cultivars is possibly due to bee activity. 20 bees per 100 sunflowers will achieve this maximum possible yield difference. Twenty bees per 100 plants is not a terribly high population and will usually be achieved if a bee yard is located within foraging distance of the growers field.

We have said for years that if we were sunflower growers we would encourage a beekeeper to locate a yard or two near our field. But we would not pay pollination rental for bees in currently grown sunflower cultivars. At this point I would say the same thing about the use of an attractant.

Dave Noetzel
Extension Entomologist

Climatic Patterns Following Late Planting in Minnesota: Don't Throw in the Towel Just Yet!

Late planting of small grains and sugarbeets is raising some concern about both the quantity and quality of this year's crop. But, a historical view of crop-climate relationships following late planting suggests that it is too early to speculate about yield and quality. Looking at climate analogies (similar spring climatic patterns) sheds some light on this.

This year, wet soil conditions coupled with a cool spring weather pattern delayed planting as in in the following crop years: 1945, 1947, 1950, 1954, 1956, 1965, 1970, 1974, and 1979. Despite the poor start, a favorable climatic pattern during June, July and August improved crop development and yield prospects in 1947, 1954, 1956, 1970 and 1974 (although 1954's climatic

gains were negated by a widespread outbreak of rust). None of these years produced record crops, but respectable gains in yield and quality were achieved in many counties.

These years serve as examples and illustrate the potential for climatic recovery. Indeed, nearly 50 percent of those late planting seasons, nevertheless produced a reasonable crop.

A relatively dry and sunny pattern expected to persist over the next week will permit planting much of the remaining 1995 crop acreage. Subsequent crop management (fertility, weed control, etc.) should be geared to achieving long-term average yields.

Mark Seeley
Extension Climatologist

In Postemergence Weed Control, Timing is Everything

Vol. 1 No. 8 issue of *Minnesota Crop News* encourages growers that are behind in their planting operations to focus more of their weed control efforts on postemergence weed control. While the focus on early planting dates is sound, a better understanding of the dynamics of weed-crop competition and emergence patterns should be considered before moving to a total postemergence weed management program.

The length of time that weeds can remain in a crop before they interfere with crop growth and reduce yields is one component of the critical period of weed control and is useful in the timing of postemergence herbicide applications and cultivation. Based on the literature, corn and soybean yields begin to be affected by weeds when the weeds persist for the first 4 to 6 weeks of the growing season, with a dramatic increase in the rate of yield loss after this time period. The beginning of the critical period of weed control in corn (especially in the northern corn belt) appears to be more highly variable than in soybeans. Based on my Minnesota experiences to date, it is likely that corn may be less tolerant of early season weed pressure than soybeans.

Several factors influence how long weeds can grow with a corn or soybean crop before influencing yields. These factors are as follows:

1. **Time of weed and crop emergence.** Weeds that germinate before or near the time of crop emergence will be most competitive with the crop.
2. **Crop environment.** As nutrients, water, or light become limited, weeds will be more likely to impact crop growth and yield.
3. **Weed population.** As the population of weeds increase, the more rapidly nutrients, water, and light may become limiting and the greater the impact on crop growth and yield.
4. **Weed species.** Some weed species are more competitive than others and require fewer plants to make an impact on crop growth and yield.

Let's use the example of corn postemergence grass control as an example to explore the impact of the critical period of weed control on weed management strategies. In this example, the timing of weed control strategies may not be dictated by when the weeds influence corn growth and yield potential, but rather by when the time of cultivation or postemergence herbicide application is appropriate for the crop development stage and susceptible stages of weed growth. Too elaborate, in corn most annual postemergence grass control is accomplished with Bladex (cyanazine), Basis (primisulfuron + thifensulfuron) or Accent (nicosulfuron) herbicides. Bladex is effective on many of the annual grasses if applied before they exceed 1.5 inches in height. Bladex

cannot be applied to corn once it's 5th leaf is visible. Basis is effective on foxtail species, barnyardgrass and fall panicum that are 1 to 2 inches tall. Basis should not be applied to corn taller than 4-leaf (2 collars) or to corn with a relative maturity of less than 88 days as crop injury may occur. Both Bladex and Basis have some degree of residual weed control in the soil. The degree of residual control is dependent upon rainfall. Accent is effective on most annual grasses if applied before they exceed 4 inches in height and Accent can be broadcast applied on corn up to 24 inches tall. Accent does not have residual grass control. Therefore, under most circumstances corn or grass weed size would dictate and keep the time of postemergence weed control to within the critical period for corn.

Studies in 1994 at Waseca and Lamberton, Minn. highlight the effects of time of Accent application on giant and green foxtail, respectively and resulting corn yields (Table 1). At both locations, corn was planted in early May in fields with high foxtail density. Additional herbicide was used in early June to control broadleaf weeds. Accent applications 14 and 21 DAP (days after planting) on 0.5 - 1.5 inch foxtail and 2 - 4 inch corn resulted in excellent early season foxtail control. However, by the middle of the growing season late emerging foxtail reinfested the area and corn yields were reduced. Application 28 to 35 DAP on 2 - 6 inch foxtail and 7 - 11 inch corn provided the highest yielding treatments, with application to 2 - 5 inch foxtail providing the most consistent yield response across locations. Application of Accent 39 to 41 DAP on 7 - 10 inch foxtail and 13 - 16 inch corn resulted in excellent late season foxtail control. However, yields were reduced by early season foxtail infestations.

Another challenge to the postemergence weed control strategy is the time of weed emergence and the diversity of grass and broadleaf weeds present in the soil. For example, foxtail (*Setaria spp.*) and common lambsquarters (*Chenopodium album L.*) generally germinate earlier in the growing season than common ragweed (*Ambrosia artemisiifolia L.*) and common cocklebur (*Xanthium strumarium L.*). Therefore, when you combine the challenges of timing postemergence weed control discussed earlier with nonuniform weed emergence patterns, the success of a one-pass postemergence weed control strategy is unlikely. In fact, because many large seeded broadleaf weed species (e.g. common cocklebur) are not controlled by soil applied herbicides, the idea of one-pass weed control is just as unlikely with soil-applied herbicides.

The use of herbicide tank mixtures to ensure broad-spectrum weed control can also be an obstacle to one-pass weed

Table 1. Effect of Accent time of application on foxtail control and corn yield at Waseca and Lamberton, MN

Location	Time of Application (DAP)	Foxtail Height (inches)	Foxtail Control		Yield (% of weed-free control)
			July	Sept	
			----- % -----		
Waseca	14	0.5	48	56	63
	21	1	54	58	69
	28	2 - 5	81	84	88*
	33	5	88	87	85
	39	8	97	99	68
Lamberton	14	0.75	74	66	91
	21	1.5	80	68	88
	28	2 - 4	88	81	94*
	35	4 - 6	97	93	94*
	41	7 - 10	96	97	86

*Statistically equal to weed-free control

control. When combining many of the postemergence broad-leaf herbicides with grass herbicides, the possibility of antagonism (reduced control) or crop injury is often increased. Therefore, before tank mixing herbicides always read the label and carefully note which herbicides and adjuvant you can use in a tank mixture.

Due to the conflict of time of herbicide application with differential weed emergence patterns and the consequences of delaying weed control for too long of a period into the growing season, integrated weed control systems that will reduce a crop producers time in the field without increasing

the risk of weed control failure are necessary. Currently, one of the most low-risk strategies available that can be accomplished in a timely manner is to use sequential applications of soil-applied and postemergence herbicide's and/or cultivation. Despite the extra costs involved, 1994's Herbicide Evaluation Trials indicated that the sequential application of a soil-applied and a postemergence herbicide often resulted in a very cost effective treatment and reduced the risk of missing critical postemergence application windows.

Jeffrey L. Gunsolus
Extension Agronomist—Weed Science

DIAL U

Dial U is a user-fee telephone diagnostic clinic for calls and samples related to gardening, landscapes, plant diseases, insects and wildlife associated with the home environment. Calls from the public are taken at 1-900-988-0500 weekdays. A flat \$2.99 charge is billed automatically to the phone from which the call is placed.

Creeping Charlie Calls Keep Coming

Creeping charlie also goes by the name "ground ivy" or "creeping jenny" in some parts of the country. But whatever name you call it, it's one heck of a tough weed to eliminate.

People really detest creeping charlie, even though it's a far better groundcover than grass in shady locations. The reason it's so despised is that creeping charlie moves aggressively out of the shade and into sunny lawns. Needless to say, it doesn't respect lot lines between neighbors.

Dial U is swamped with creeping charlie calls each spring, primarily because people are anxious to work on their lawns after a long winter cooped up indoors. However, the best time to spray creeping charlie is autumn. Like other perennial weeds, it stores carbohydrates at that time, so herbicides move more efficiently into the roots and are more effective.

You can use a broad-leaf herbicide on creeping charlie in spring when temperatures are in the 60's, 70's or low 80's, if you wish, but you must be very careful. There's lots of tender young foliage around, and it's possible to do a considerable amount of damage. To spray, choose a day that's not windy, with no rain is forecast for the following 48 hours.

Broad-leaf herbicides should be used where creeping charlie is growing in among established grass, not where half or more of what you see is creeping charlie. In those cases you'd be better off spraying the area with glyphosate and starting over. If the area is really shady, replant with a shade-tolerant groundcover rather than struggling to grow grass.

Herbicides containing Trimec (2,4-d, MCPP, and dicamba) yield best results against creeping charlie, but the dicamba can be picked up by small feeder roots of trees and shrubs. Never apply it below the canopy of a tree or where it can wash into the roots of shrubs or garden plants. Spray only the weedy areas of the lawn, hitting the surface of the foliage rather than soaking herbicide into the soil. Avoid using weed & feed products that contain Trimec in those areas, also.

Use a hand-held or tank sprayer rather than the type you connect to the end of your garden hose. It's too easy to allow the material to drift onto desirable plants using a hose end sprayer, and many of them don't deliver the correct dilution of product.

Next week; a discussion about trying borax to control creeping charlie.

Deborah Brown
Horticulture

Ground-nesting bees are being found in gardens and other sites in the yard. These bees, a type of andrenid bee, prefer to nest in the ground in sunny, dry sites, especially south-facing slopes. People often describe seeing many bees at one time. Although these bees are solitary, i.e. they live in individual nests, they live

gregariously, i.e. many bees nesting close together. They give the appearance of a swarm as they move in and out their nest entrances. Fortunately, these bees are very docile and stings are rare.

Tolerate and ignore the bees when possible; they are beneficial as pollinators and should be preserved. If it is necessary to discourage them, keep areas where they nest moist. Because they prefer dry sites, they are likely to move away on their own. As a last resort try carbaryl (Sevin) for temporary chemical. These bees seem to be more conspicuous in spring and less obvious in summer.

Entomology Notes—Birch leafminer adults were first seen in the Twin Cities on May 15. We expect first mines to appear sometime next week. If control is attempted, the best timing is when mines are first evident... We have been getting calls about when to spray for yellowheaded spruce sawfly and mountain ash sawfly. The larvae are not active until early June (sooner in southern Minnesota). Watch trees regularly and treat when sawfly larvae are small.

Other common calls: carpenter ants!

Jeffrey Hahn
Entomology

Douglas Fir Needle Disease

Douglas fir has a needle disease which causes needles to discolor and fall prematurely. The disease is called Swiss needlecast and is caused by the fungus, *Phaeocryptopus gaeumannii*. If you are familiar with *Rhizosphaera* needlecast on spruce you will easily identify this disease as the two look very similar. Needles become infected their first season but do not turn a yellow-brown and fall from the tree for up to three years. By the time the disease is dramatic enough to be seen, the infection is very well established within the tree and significant defoliation often results.

Close examination of the underside of green and discolored needles reveals rows of small black fruiting (reproductive) structures. These structures release spores during early summer which infect the new needles. Rainy summer weather favors infection although there is a lot of variation from tree to tree. If necessary, a fungicide such as Bordeaux mixture or chlorothalonil (trade name Daconil 2787) can be applied the last two weeks in May and again in 4-6 weeks to protect the new needles from infection. Promote good air circulation with proper tree spacing and weed control. Improve tree vigor by mulching and water during dry periods. Inspect trees before purchase to be sure they are healthy and avoid planting next to diseased douglas fir.

Cynthia Ash
Plant Pathology

MINNESOTA EXTENSION SERVICE

UNIVERSITY OF MINNESOTA
COLLEGE OF AGRICULTURAL, FOOD,
AND ENVIRONMENTAL SCIENCES

Produced by the Educational Development System, Minnesota Extension Service.

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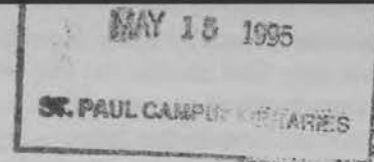
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CROP

NEWS

From the
Crops System Team
of the
Minnesota Extension Service



Corn

Will Black Cutworm Migration Reach Minnesota?

The cool, wet weather that has delayed planting has a slight hint of a silver lining. Each of the major storm systems has passed to the south of Minnesota with little opportunity for migrating black cutworms to reach Minnesota. Pheromone trap captures remain light throughout the state.

Are we out of the woods on black cutworms yet? It's too early to tell. Delays in planting and cool soils that delay germination will keep us somewhat susceptible to migratory flights over the next week or two. We'll keep monitoring each storm system and alert you to any problems.

Insect Problems in CRP Conversion to Cropland

The announcement to allow early termination of CRP contracts has some farmers contemplating conversion of CRP to cropland. Stand reduction due to built up insect populations in CRP needs to be considered. How great is the risk of stand loss? I don't know. Previous experience during the 1960s suggests we'll see a wide range in insect attack from nothing to areas with substantial stand loss.

Which crop is best the first year after CRP? Insects causing stand loss are only part of the decision. Corn compensates very little for stand loss, so it is the most susceptible. In contrast, soybean can tolerate stand reductions from 160,000 plants/acre to nearly 80-90,000 without appreciably affecting yield. The bottom line: If you're planting corn, plan on stand protection.

What insects are likely to pose a threat after CRP? Some insects like wireworms, white grubs and sod webworm are noted for their association with grasses. Wireworms and white grubs are expected to be dominant problems based on experiences in the late 1950s and early 1960s breakup of sod in pastures and soilbank fields. They offer the added complication of a longer life cycle (wireworms =

2-5 years, white grubs = 3 years), so there may be problems next year as well. Other insects such as seedcorn maggot (attracted to partially buried, decaying vegetation) and seedcorn beetles (a problem under cool, wet soils) are opportunistic and incidence is unpredictable.

What management options are available?

1) *Do nothing and risk stand loss.* Unfortunately, no one knows the risk you face. The only way to hedge your bet is to plant a crop more resilient to stand loss, e.g. soybeans or sunflowers over corn.

2) *Use a seed treatment.* Seed treatments protect the

Highlights...May 12, 1995

Corn

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Entomology Notes

Removing Large Tree Roots From Lawn

Needle Blight of Pines

Corn/Continued

seed and the newly germinating plant from wireworms, seedcorn maggot, and seedcorn beetles. Unfortunately, they do not offer protection against white grubs, cutworms, or the later feeding of wireworms. Seed treatments for corn include Kernel Guard, Sorghum Guard, Germate Plus, Agrox DL Plus. The cost of this approach is fairly reasonable, @ \$0.75/acre for corn, \$2/acre for soybean. Follow the label closely regarding application and seed disposal issues!

3) *Use a soil insecticide.* Soil insecticides offer the best spectrum of activity but at a

greatly increased cost, \$7-16/acre depending on product and application rate. Soil insecticides may pose a problem for some farmers for three reasons. First, not all planters are equipped with soil insecticide boxes. Second, most of the soil insecticides require farmers be certified applicators. Finally, some farmers will be concerned about applicator safety issues, especially if they aren't used to working with soil insecticides.

* Carefully note the performance spectrums of products (See table). Since wireworm and white grubs are likely to be important pests, make sure they can be controlled.

* Decide on placement. The best placement is probably infurrow since it concentrates insecticide around the seed. Be careful! Some products are not labeled for infurrow application.

* Check over the insecticide boxes. Best performance depends on proper maintenance, especially if they

Activity Spectrum of Soil Insecticides

Insecticide	SCM	SCB	WW	WG	CW
Counter	Y	Y	Y	Y	N
Dyfonate II	Y	Y	N	N	S
Force	Y	Y	Y	Y	Y
Lorsban	Y	Y	S	S	Y
Thimet	Y	Y	Y	Y	N

SCM = seedcorn maggot WW = wireworm
 SCB = seedcorn beetle WG = white grub
 CW = cutworms

Y = Labeled for control
 S = Labeled for suppression
 N = Not on label

haven't been used lately! Clean soil and refuse out of the boxes and make sure the tubes are clear.

* Calibrate the planter.

4) *Scout and apply a rescue insecticide.* This approach will not work for most soil insects. No rescue options exist for wireworms, white grubs, seedcorn maggots or seedcorn beetles. Only cutworms and sod webworms can be controlled by rescue sprays. If you've already chosen options 1, 2 or 3, I'd still advise checking the germinating plants for signs of cutworm feeding: holes in leaves, cut plants, "dead-heart", and wilting.

For further information on seed treatments and insecticides recommended for soil insects, consult Minnesota Extension Service Bulletin 0500 *Insecticide Suggestions for Insect Pests of Field Crops in 1995*.

Ken Ostlie
 Extension Entomologist

Delayed Planting Increases Need for Treating Scabby Wheat Seed

Seedborne scab can result in a condition referred to as seedling blight when soil temperatures are favorable for *Fusarium graminearum* (the fungus that causes scab). Producers forced into using scabby planting seed should be concerned about potential stand losses, especially under our delayed planting conditions. Seed treatment will be critical insurance when using lots of marginal quality.

The effects of seedborne scab may be difficult to interpret from germination tests. Scabby seed (especially if it has been thoroughly cleaned) will often be near-normal in size and will germinate fairly well in ragdoll tests. When

seed like this is planted, it can produce a "normal" seedling. If soil temperatures are warm, however, seed-borne *Fusarium* can grow rapidly and kill plants before they become established. Stand losses typically stop after about 3 to 4 weeks as root, crown and leaf development outpaces the ability of *Fusarium graminearum* to cause additional damage. The net effect in a field, however, is a reduced stand. Stand that appears to thin out uniformly (not in patches) as weakened plants die off.

Important factors associated with seedling blight include: 1) It is primarily a function of seedlot quality and is

Table 1. Information on 1994 Spring Wheat Seed Treatment Trials in Minnesota

Location	Planting Date	2 - 3 leaf Stand Rating	x soi High	temp Low	10 DAP Ave.
Crookston 1	4/20	5/18 (28 DAP)	60.4	40.4	50.4
Crookston 2	5/11	6/01 (21 DAP)	84.3	56.1	70.2
Morris	5/11	5/26 (15 DAP)	78.6	55.0	66.8
Roseau	5/03	6/02 (22 DAP)	60.3	44.3	52.4

Variety = Norm Seeding rate = 2.0 bu/acre
 Replications = 6 Previous crop = wheat

Table 2. Stand counts (2 - 3 leaf stage) of spring wheat seed treatment trials in Minnesota - 1994.

Treatment	Rate/bu	Plants/ft ²			
		Crookston(1)	Crookston(2)	Morris	Roseau
DB Green - L	3.0 oz	31.8	27.3	30.7	17.2
DB Green - L	3.0 oz				
+ Agsco RR	+0.4 oz	33.0	25.7	29.5	16.6
Dividend	0.25 oz	26.8	19.8	N.T.	16.0
Dividend	0.50 oz	29.3	21.7	23.7	16.6
Vitavax Xtra	1.8 oz	30.8	28.8	32.8	16.7
Check 1993 seed	--	20.2	12.3	11.2	13.5
L.S.D. (P=0.05)		3.0	2.4	3.1	N.S.

N.T. = Not tested
N.S. = Not significantly different.

not a function of field related factors such as previous crop; 2) Soil temperatures from planting to the 2-leaf stage affect both growth of the fungus **and** growth of the seedling. 3) Surviving seedlings may have an increased incidence of crown rot but infections are not systemic to the heads. **Head scab infections develop independently and will not be affected by seed treatments.** 4) All varieties should be considered equally susceptible to seedling blight (i.e. the partial resistance to head scab in 2375 is an adult-plant type of resistance and is not expressed at the seedling stage).

The effect of planting date on seedling blight is partly a function of soil temperatures. In 1994, seed treatment trials were planted in Crookston, Morris and Roseau using a scabby lot of Norm seed. At Crookston, two planting dates were established (April 20th and May 11). Plots at all sites were seeded at 2.0 bu/ac and stand counts were made at the 2-3 leaf stage (Table 1). Soil temperatures (2" depth) were recorded daily at each location.

Seed treatment significantly improved stand at all sites except Roseau (Table 2). Shallow seeding in dry conditions reduced all stands at the Roseau site and no significant differences were observed among treatments. The April

20th seeding at Crookston (Crookston-1) averaged 20 plants/ft² from a 2 bu/ac seeding rate of scabby Norm (Table 2). Soil temperatures for 10 days after planting at Crookston (1) averaged 50 degrees (Table 1). This same seedlot only produced 11 to 12 plants/ft² when seeded May 11th at either Crookston (2) or Morris (Table 2). **Average** soil temperatures 10 DAP for these tests were 66.8 and 70.2 degrees respectively (Table 1). The warmer soil temperatures resulting from later planting were much more favorable for seedling blight development.

Predicting an economic return from seed treatment fungicides is difficult. Economic thresholds cannot be applied when soil temperature and seed quality are variables. In general, seed quality for 1995 is poor. High quality seed (such as that produced outside of the scab affected area) will not likely benefit from seed treatment unless loose smut or other diseases are established problems. Late planting increases the risk of soil temperatures favoring seedling blight when scabby wheat seed is used for planting.

Roger K. Jones
Extension Plant Pathologist

Warmer Temperatures Overdue

Current mean four inch soil temperatures around the state are from 4 to 6 degrees colder than normal for this time of year, partially due to persistent cloud cover, wetness and cool air temperatures. Many places in the state have yet to see a 70 degree maximum temperature this spring. The pattern of the past 6 weeks appears to be changing as the new weather outlooks call for more southerly winds, generally higher pressure, drier conditions, and a warming trend to begin the week of May 15th. As soils dry, they will warm more dramatically and probably start to average in the 50 to 60 degree range, which should dramatically shorten the germination interval for sown crops.

Examining Climatic Probabilities

Late planting of small grains and sugarbeets will likely push back the critical development phases for these crops into late summer. Climatic probability distributions can be used

to examine what type of climatic conditions are most likely to occur at various times in the growing season. An example for Ada, MN is shown on page 60 using the historical record to examine the frequency of maximum temperatures and precipitation. The tables reflect the distributional characteristics of these climatic parameters. For example, in the month of July, only 25 percent of the daily maximum temperatures are 79 degrees F or less, while 75 percent of the maximum temperatures are 88 degrees F or less.

Similarly, 25 percent of the time July rainfall is 1.89 inches or less, while 75 percent of the time it is 4.54 inches or less. These probabilities can be derived for a number of locations in Minnesota either on a weekly basis or a monthly basis. Over the next several weeks we will place such data on the MES Gopher under the climatology section. If you don't find what you are looking for, contact me by phone (612-625-4724) or by e-mail (mseeley@soils.umn.edu).

Weather/Continued

Probabilities: Maximum Temperature (F)

Station: ADA, MN Years: 1948 To 1995

Mo.	Low	5%	10%	25%	50%	75%	90%	95%	High
Ma	32	50	55	64	71	79	85	88	97
Jn	50	66	68	73	78	83	89	91	98
Ju	58	72	75	79	83	88	92	94	105
Au	58	69	72	77	83	88	92	95	104
Se	44	54	58	64	71	78	85	88	100
Oc	24	39	43	50	58	66	73	78	93

Probabilities: Precipitation (in)

Station: ADA, MN Years: 1948 To 1995

MO	1%	5%	10%	25%	50%	75%	90%	95%	99%
Ma	0.35	0.70	0.97	1.59	2.56	3.86	5.35	6.39	8.67
Jn	0.73	1.26	1.64	2.45	3.64	5.15	6.83	7.98	10.45
Ju	0.42	0.84	1.17	1.89	3.03	4.54	6.27	7.48	10.12
Au	0.39	0.76	1.03	1.65	2.60	3.86	5.28	6.28	8.44
Se	0.13	0.34	0.52	0.97	1.74	2.85	4.17	5.12	7.24
Oc	0.05	0.14	0.25	0.58	1.22	2.22	3.49	4.44	6.67

Mark Seeley
Extension Climatologist

ALFALFA

Alfalfa Weevil

As the cool weather continues, there has been minimal alfalfa growth to date, but also minimal weevil DDs accumulated since last week (see Table below). Although we are still tracking close to 30-yr normals, we are presently behind what has been more of the norm during the past 10 years. For example, at Rosemount, by this same date in 1993 and 1994, we had accumulated 182 and 209 DDs, respectively.

Using current temperature data up through May 8th, plus 30-yr avg. temps. for the remainder of the month, the current forecast (for Rosemount area; Dakota Co.) is that we will not approach 300 DDs (time of peak first-instar larvae and time to start checking fields) until approx. May 27th.

Bill Hutchison
Extension Entomologist

Cumulative Degree-Days for Alfalfa Weevil (>48°F) in Minnesota (as of May 8, 1995)**

Alexandria	-	73	Olivia	-	113
Caledonia	-	125	Rochester	-	109
Cambridge	-	93	Rosemount	-	132
Faribault	-	106	St. Cloud	-	101
Mankato	-	133	Waseca	-	128
Morris	-	84	Winona	-	133

30-yr averages for Comparison

Faribault = 115
Rosemount = 94
Waseca = 106

Weed Identification Sample Preparation and Mailing

Weed identification is the first step in an effective and economical weed control program. Local sources, such as county extension educators, Vo-Ag instructors, or agricultural inspectors, can help with the identification of many weeds. However, if there is a weed identification problem that cannot be solved locally, you can mail the plant specimens to:

Beverly R. Durgan
Extension Agronomist - Weed Science
411 Borlaug Hall
University of Minnesota
St. Paul, MN 55108

I will identify them and give control recommendations as soon as possible.

Please observe the following suggestions for preparing and mailing the plant samples, so that I will have a good specimen to examine.

1. **DO NOT** put weeds into plastic bags or wrap in plastic wrap. The plants will turn to mush.
2. **DO** put the plants in a fold of paper towel or newspaper. Press overnight under a heavy book, and mail them in the paper. Plants can be folded, if necessary, to accommodate the envelope.
3. Please try to mail all plant samples at the beginning of the week, so that they will not sit in the post-office over the weekend.
4. Send in an identifiable portion of the plant, usually the top growth with flowers and/or fruits, if available. Roots are not normally needed for identification of older plants,

** Estimates based on double sine-wave method. Data provided by Dave Bartels, Department of Entomology

however, if sending weed seedlings or vegetative plants, please send the entire plant.

5. Provide the following information on the weed to identify or use the prepared Plant Identification Forms — available from the Agronomy Extension Office or your local County Extension Office.

Information to include with the plant sample:

Type of root system: tap root, fibrous root, rhizomes, etc...

Habitat of plant (where growing, such as __ on sandy hill side).

Growth habit (erect, prostrate, viny, etc...).

Does the plant have **milky juice in the stem or leaves?**

6. To insure that I get the plant sample as soon as possible, write on the outside of the envelope "Plant Identification Sample."
7. If you want weed control recommendations, please indicate the area where the weed is to be controlled. For example: roadside, corn field, etc.

All lawn and garden weeds should be sent to the Dial U Clinic, 155 Alderman Hall, 1970 Folwell Ave., St. Paul, MN 55108.

*Beverly R. Durgan
Extension Agronomist - Weed Science*

Weed Control in Crops Following Winter-Killed Alfalfa

Severe winter-kill of alfalfa has occurred in some areas of Minnesota (see *Minnesota Crop News*, vol. 1, No. 7, April 28 issue). Now you are faced with the situation of evaluating the viability of alfalfa stands and the possibility of re-

planting to another crop. One of the major problems encountered when planting corn or soybeans following winter-killed alfalfa is that often enough regrowth alfalfa remains to compete with the new crop. Remember, populations of alfalfa considered **unacceptable** for profitable forage production are much different than **acceptable** populations as a weed in corn or soybeans. Just a portion of a poor alfalfa stand that might survive seedbed preparation can cause severe crop competition as a weed.

Soybeans can be the most challenging. If you are following winter-killed alfalfa with soybeans, remember there are no viable postemergence herbicide options that will control alfalfa in soybeans. There are, however, several options that you could consider before planting. Plowing followed by disking or field cultivation will provide adequate alfalfa control. Chisel plow or disking will **not** control alfalfa adequately. If plowing is not feasible, then herbicide use prior to planting (No-till) or prior to chisel plow or secondary tillage will provide control prior to planting soybeans. Spray alfalfa when it is approximately 4-6 inches tall with 1 qt./A of Roundup and 1 pt./A of 2,4-D ester. This amount of a 2,4-D ester will still allow you to plant soybeans within seven days. Greater amounts of 2,4-D would require a 30-day waiting period. Our experience has found spring applications of 2,4-D at rates less than 1-1/2 pts. to 2 pts. per acre do not always provide complete control of alfalfa, but the addition of Roundup does, and will provide control of grasses present.

Viable postemergence alfalfa control options do exist in corn. Banvel or 2,4-D postemergence will control most alfalfa regrowth. Therefore, tillage or no-till options are much more flexible when planting corn.

*Jeffrey L. Gunsolus and Roger L. Becker
Extension Agronomists — Weed Science*

Transgenic Potato

You will undoubtedly be hearing about transgenic potato from all directions. These are cultivars of potatoes with a piece of protein (Cry III(A) delta endotoxin) transferred from *Bacillus thuringiensis tenebrionis* into the potato. The activity of the transferred protein is primarily toward Colorado potato beetles (CPB) and is extremely effective in control of both insecticide resistant and susceptible beetles. The protein is fixed in the potato so that henceforth potato seed can be produced vegetatively as they normally are.

The first commercial cultivar has already been planted on several hundred acres in the region. Within the past couple of weeks all legal hurdles have been cleared so that the NewLeaf® potatoes that have been planted can be used commercially.

Transgenic potatoes will permit reduced use of traditional insecticide against CPB. Hopefully more biological control will be retained in that process. At the same time it is critical for us to remember that potato leafhopper (PLH) and various aphid species remain major pests of these NewLeaf® potatoes as well as standard potato cultivars. Some of us feel the PLH, and not CPB, is Minnesotas Num-

ber 1 insect pest in the potato crop.

It is now even more important that potatoes be monitored and that standard controls for PLH and aphids be applied as needed. In those fields to which Admire (a new Bayer soil systemic) has been applied additional foliar will probably not be needed. However as the acres of NewLeaf® potatoes increase insect management practices will have a stronger cultivar, and field, basis than in the past.

Over the long term CPB has the potential to become resistant to the transgenic potato as it has to other standard insecticides.

If you are growing potatoes, or consulting with potato growers, you will have to develop a long term approach to insect control in the crop so that these first transgenic potatoes will be useful for a long time. There are a number of new insecticides that are quite effective against resistant CPB that are not far from label. Considerable thought should be given to a control mix and/or rotation that slows resistance development during the years ahead

*Dave Noetzel
Extension Entomologist.*

Winter Injury in Hard Red Winter Wheat

In southern and central Minnesota, a few hard red winter wheat growers have experienced some winter injury in their winter wheat.

The injury in growers' fields is mostly in areas of the field that lacked snow cover or had ice formed after the warm period during the winter. It should be very evident by now if plants are winter injured. Growth is evidenced by new green leaves from the crown and by some new white roots. If the roots are brown and the crown does not have any new green leaves, then the plant is probably dead.

Normal plant populations for winter wheat should be 17 to 20 plants per square foot. Winter wheat has the capability of tillering, especially when spring temperatures are cool, thus plant populations as low as 10 plants per square foot will give adequate yield. If there are less than 10 plants per square foot, it would be advisable to rework the field and replant another crop such as soybeans.

It is too late at this date to replant the field to hard red spring wheat because yields would be reduced by 50% if planted after May 15 in southern Minnesota. In addition, it is not advisable to replant to hard red spring wheat since some winter wheat may survive after tillage, resulting in a mixed class of wheat at harvest which will be discounted. It is also not advisable to seed hard red spring wheat into areas winterkilled in a winter wheat field since this will also result in a mixed class of wheat. Additionally, the maturities differ for spring and winter wheat: thus they have to be harvested at different dates.

Good weed control is important in winter wheat, especially if the stand is thin. Winter annuals, such as penny cress (frenchweed) and shephardspurse, can be especially a problem in these fields. Winter annuals must be controlled early in spring.

Erv Oelke
Extension Agronomist

Planting Date and Rate of Small Grains in Southern and Northern Minnesota

Planting Date:

Southern Minnesota. Hard red spring wheat, spring barley and oat planted at this date, May 11, will experience lower yield compared to mid-April plantings. Multi-year experiments at Lamberton and Morris with hard red spring wheat resulted in a 36% yield reduction when planted on April 18 compared to May 15. Growers should consider switching their intended small grain acreage to alfalfa, soybeans or corn; or if planting alfalfa with oat, the oat crops should be intended for forage harvest rather than grain yield.

Central Minnesota. In the Morris area, small grain yields would not be reduced as much by planting at this date compared to the Waseca/Lamberton area. Multi-year trials at Morris with hard red spring wheat results in a 7% loss in yield from April 17 to April 28 and a 10% reduction from April 17 to May 29. However, in a very late year when the first planting was done on May 15 and the second on May 29, a 13% yield loss occurred. The third planting on June 12 resulted in a 34% yield reduction compared to the May 15 planting. On the average a 10-15% reduction in yield probably would have occurred by this date, May 11, compared to an April 15 planting. Some experiments with barley at Morris gave a 12% reduction in yield when planted on May 14 compared to April 23. In the Morris area, small grains could still be planted, but expect a 10-15% yield reduction if normal temperatures occur during the next few weeks.

Northern Minnesota. Results from numerous date of planting experiments with wheat at Crookston, where the first dates ranged from March 24 to May 15 and the last from May 22 to May 29, were mixed. However, usually yields were similar for late April and mid-May plantings, thus if small grains can be planted within the next week, yields should still be good without significant yield reductions. If plantings get delayed toward the end of May, yields

could be reduced 1% per day after May 15 if temperatures are normal. If temperatures remain cool, even late May plantings could yield well. The relationship of scab in wheat and planting date is not clear based on John Weirsma's experiments at Crookston. The amount of rain during flowering is more critical than planting date. Yields of barley planted on May 11 compared to May 31 were reduced by an average of 15% which is less than 1% per day yield loss.

The main factor contributing to yield loss due to delayed planting in small grains is the probability of higher temperatures during the 4 to 5.5 leaf stage of growth. This is the growth stage when the number of spikelets on the head is determined. This then results in fewer kernels per head. Tiller number is also reduced when the length of the tillering period is reduced due to warm temperatures. High temperatures (90°F) during grain fill will reduce kernel fill, thus also yield.

Planting Rate:

Planting rate should be determined on the basis of number of viable seeds per acre. The number of viable seeds planted should be 30 per ft². This will give about 1.3 million plants (main stems) per acre if no stand losses occur in the field. To calculate the number of viable seeds to be planted, you need to determine:

1. Desired population of plants at harvest
2. Average predicted stand loss for your farm (this can range from 10 to 30%).
3. Germination of seed lot
4. Number of seeds per pound of the seed lot

An example for calculating planting rate for wheat:

1. Desired population is 1,300,000.
2. Historic field loss is 10%.
3. Seed lot germination is 95%.

4. Seed lot has a seed count of 12,700 seeds/lb (This can be the case for the variety 2375). Some certified seed lots will have the number of seeds/lb on the tags; if not, check with your seed supplier - they may have this information.

Then: $12,700 \times 0.95 = 12,065$ viable seeds per pound
 $1,300,000 \text{ seeds} \times 1.10$ (10% field loss) = 1,430,000 seeds needed per acre

$1,430,000 \text{ seeds needed} \div 12,065 \text{ viable seeds/lb} = 118$ pounds per acre seeding rate (actual seeds per $\text{ft}^2 = 34.4$)

Planting rates for mid to late May plantings should be increased by 10% to compensate for fewer tillers per plant that may result from the warmer temperatures during tiller initiation, which occurs during the 3-4 leaf stage. If seeds have good germination (95%+) planting rates of 2 bushels per acre for wheat need not be increased when planting late, particularly for smaller seeded varieties that have more seeds per pound than 2375. Normal planting rates below 2 bushels per acre probably should be increased by 10% when planting is late.

Ern Oelke
Extension Agronomist

DIAL U

Dial U is a user-fee telephone diagnostic clinic for calls and samples related to gardening, landscapes, plant diseases, insects, and wildlife associated with the home environment. Calls from the public are taken at 1-900-988-0500 weekdays. A flat \$2.99 charge is billed automatically to the phone from which the call is placed.

Eastern tent caterpillars have been reported recently in the Twin Cities. The especially love to eat the leaves of apple, flowering crab apple, cherry, plum, and chokecherry. In some cases the caterpillars are out before the trees have barely leafed out.

These caterpillars are easy to identify by the silken webbing or tents they produce in the crotch of trunks or branches. They normally don't kill a healthy, mature tree in one year but they are usually unsightly.

The easiest control is to physically remove the webbing and the caterpillars out of the branches and destroy them (e.g. bagging, burying, burning). Do this on a cloudy day or during the evening after the caterpillars have returned to their 'nest'.

If the tree(s) is(are) too big or too numerous for physical removal, spray an insecticide such as acephate (Orthene), malathion, carbaryl (Sevin), or *Bacillus thuringiensis* on the leaves. If the tree is flowering, use only *Bacillus thuringiensis* to avoid poisoning bees.

Entomology Notes—Asparagus beetles have been noticed causing damage in the Twin Cities recently. Treat now to minimize damage. Spray with carbaryl (Sevin) or malathion (be sure asparagus is on the label)... The latest computer prediction estimates the first birch leafminers in central Minnesota to first occur on June 5 (this date will be earlier if we receive warmer weather)... Cankerworms have just begun hatching in the Twin Cities.

Jeffrey Hahn
Assistant Extension Entomologist

Removing Large Tree Roots from the Lawn--We've received many calls from people who are frustrated trying to mow the grass beneath large trees, due to the presence of surface roots that stick out of the soil. (We also get calls from people who are unable to grow much grass under those trees no matter how hard they try.)

People who are having a hard time with surface roots generally want to remove them in order to make it easier to run a lawn mower in the area. At Dial U we try to discour-

age this practice. At best, it is only a temporary solution — new surface roots will develop before many years pass. At worst, the trees could be adversely affected.

You may only need to remove the few feet of root that protrude from the soil. But remember, all the roots that feather out from that portion -- maybe as far as 20 or 30 feet away — will also be killed once you sever their connection to the tree. Keep in mind, too, that those large, wide reaching roots give trees stability, and help anchor them when strong winds blow.

Covering the roots, even with a light soil mix, won't help the situation much, as it would still be hard to mow over them. And you can't put more than 1/2 inch of soil on top of grass at any one time, and expect it to continue growing well. When mowing becomes impossible, consider spreading a wood chip mulch in the area, or planting a bed of shrubs, perennials or groundcovers that require no mowing.

Deborah Brown
Extension Horticulturist

Needle Blight of Pines--Spotting and banding on pine needles can be caused by a number of things including fungi. A fungal disease, Dothistroma needle blight, causes randomly distributed yellow to tan spots on needles which turn into reddish brown bands. The tips of the needles die back to the bands which contain fungal reproductive structures called fruiting bodies. If you look closely at the needles on the tree and they are dying back evenly from the tips and the damage is NOT limited primarily to the lower part of the tree, then Dothistroma needle blight is not the cause--the cause is more likely due to environmental conditions.

Austrian and ponderosa pine are the most susceptible pine species and often appear thin due to premature defoliation by this fungus. If Dothistroma has been positively diagnosed, a copper fungicide such as Bordeaux should be applied in mid-May and again in 4-6 weeks. Avoid planting trees too close together when they are young and consider pine species other than Austrian and Ponderosa.

Cynthia Ash
Extension Plant Pathologist

MINNESOTA EXTENSION SERVICE

UNIVERSITY OF MINNESOTA
COLLEGE OF AGRICULTURAL, FOOD,
AND ENVIRONMENTAL SCIENCES

Produced by the Educational Development System, Minnesota Extension Service.

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MINNESOTA

Vol. 1
No. 8

CROP

NEWS

*From the
Crops System Team
of the
Minnesota Extension Service*

Late Season Planting Challenges

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The cool wet start of the 1995 crop season has caused many anxieties for area farmers. If field work delays continue very far into May, some farmers may consider altering their management plans. Planting should become their number one priority. Crop selection, fertility, weed control, and tillage plans may need alteration if field work continues to be delayed. Some farmers may wonder if they can switch some fields from pre-plant applications or do less tillage and move planting up in priority. The real question facing producers is when losing money from delayed plantings becomes greater than the potential extra cost of switching to other management practices. These practices could include switching to more expensive forms of nitrogen fertilizer or switching to a postemergent herbicide in which a producer has less confidence. Even considering a no-till practice, or just keeping the planter close behind the tillage equipment, may be a new practice producers might consider this year.

Small Grain

If oats and wheat are not planted at this time, it is recommended that producers switch their planting intention to corn or soybeans. Late planting of oats and wheat increases the likelihood of high temperatures occurring at the critical flowering period, which will dramatically reduce yield. The exception to this recommendation is when oats or wheat are planted for reasons other than grain yield. For example, if producers plant oats or wheat for the straw, for crop rotation purposes, or for a location to spread manure in late summer, there may be the need for late planted small grain.

Tillage

There may be opportunities to reduce the number of pre-planted tillage operations. Spring tillage should be kept shallow (2"-3") with the disc or field cultivator to avoid wet soil at deeper depths when soil is not in optimum condition. It is important to provide an adequate seed bed in the seed zone. Planting in wet soil conditions will not provide good seed-to-soil contact. If soils are wet at planting, sidewall smearing of the seed furrow and compaction may occur. This can present problems for the germinating seed, especially if conditions turn dry. Subsequent dry conditions can also result in the partial opening of the seed slot as soils shrink. Poor contact may result between seed and soil. Dry, cloddy conditions at planting often produce the same problem of poor seed-to-soil contact. This prob-

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For more information contact Extension Plant Pathology at 612-625-6290

Planting Challenges/Continued

lem can be compounded by heavy crop residues (especially corn stalks), that are not cleared from the seed zone. "Hair pinning" of residue in the seed furrow allows moisture to escape and may prevent good contact of seed and soil.

Best Strategies for Spring Operations—Corn

Soybean fields that have not been tilled will dry first due to the absence of heavy cover. Avoid major tillage operations in the spring. If soil is wet, major tillage operations will increase compaction and create a seed-bed that reduces the probability of good seed-to-soil contact.

Planting corn into these fields can be done with little or no tillage. Field cultivation or a light discing is usually adequate. Research and farmer experience have shown that most conventional planters will work with very little or no tillage in medium- to fine-textured soils having soybean residue.

Starter fertilizer is important. Phosphorus is always important when planting into residue-covered fields. Potassium may also be important. The first 20 to 40 lbs. per acre of P_2O_5 or K_2O banded near the corn row usually will recover 75-90% of the corn yield response. The corn response with reduced tillage and high background levels of soil test P and K have been 4 to 6 bushels per acre. At medium to low background levels, responses have been much higher (10 to 40 bushels per acre).

Urea or urea-ammonium nitrate solutions (28%) should be surfaced banded, incorporated with cultivation, or injected to prevent volatilization losses. In cold, wet years, 28% has been a good source when applied close to the row sidedressed.

Anhydrous Ammonia

Apply only under good conditions. Wet soils and sidewall compaction from the sealing of the sides of the slot in the soil created by the anhydrous knife prevent the movement of nitrogen away from the point of injection. Then the nitrogen is more concentrated and can damage young seedlings. The best plan for eliminating damage to the seed if soils are wet and to speed up planting operations is to switch from preplant to sidedress applications. If conditions are dry and soil temperatures over 50°F, the conversion to nitrate occurs quickly and causes no threat to corn seedlings.

Impregnating NPK and broadcasting this mix of plant

food followed by a light incorporation by field cultivation is also an effective, timely way of combining a weed and feed program. Drawbacks to this type of operation are higher costs and long waiting lists at local ag service centers.

Soybeans

It is possible to plant soybeans following corn or small grain without primary tillage this spring. You need equipment that will do the job. No-till drills will work nicely. Yields will likely not be reduced. Strict attention to weed control is a must.

If the spring is wet, corn stalks can be incorporated with shallow tillage. The amount of tillage needed will vary with the amount of residue and the ability of equipment to plant in corn residue. Most newer, conventional planters (disc openers) will plant with 30% residue cover if the top two to three inches of soil is loose. If you have a conservation tillage planter or drill, no spring tillage is necessary for soybean planting.

Stay away from tillage operations that cause soil compaction (when soils are wet). This may also increase the likelihood for disease problems. Consideration of chlorosis-resistant varieties can be important under reduced aeration conditions.

Weed Control in Delayed Planting

Herbicide choice and application methods should not slow planting. Weed control practices should be selected to fit the soil and weather conditions. Producers who planned to apply herbicide preplant should consider switching to a postemergence herbicide program. The preplant herbicide program requires an additional operation and perhaps an additional tillage operation prior to planting. According to Dr. Dale Hicks, University of Minnesota Agronomist, "Job one should be to plant the corn crop right, with a good seed bed. It doesn't do any good to mulch up the seed bed and cause compaction and a related lower yield potential."

Some producers may choose to switch from a preplant herbicide to an after planting pre-emergence surface applied herbicide. Surface applied pre-emergence herbicides rely on rain to incorporate the chemical into the weed seed germination zone. A dry spell after application can result in poor performance of pre-emergence herbicides. Postemergence herbicides offer growers a wide range of treatments for almost any weed problem. Postemergence herbicides can be targeted to the weed species in the field. Timing the postemergence herbicide application for when the weeds are at the recommended size is essential for good control. A number of post-emergence herbicides are available which

offer a wide window of application timing, which provide producers with numerous weed control options. A good source for the latest weed control recommendations is the *Cultural & Chemical Weed Control in Field Crops* bulletin, BU-3157, published by the Minnesota Extension Service which is available in all Extension Offices.

Alfalfa Situation

Reports are coming in from all over the area regarding the poor condition of the alfalfa fields after the winter of 1994-95. The lack of snow cover, the presence of ice sheets in some fields, and the cold snap on April 4th after the alfalfa had broken dormancy have been cited as the major problems. Last fall's cutting management does not seem to be playing a major factor as severe damage is showing up on fields last cut in August as well as those cut in October.

When checking your stand of alfalfa, pull on the plants. If they can be easily pulled from the soil, the taproot is dead. Even if there is some regrowth coming from the crown, the plant should be considered dead. Dig a few plants out and examine the taproots. If they are white, they are healthy and will produce harvestable top growth. If there are spots of decay, time will be needed to see how they develop. If the plants grow through the six-inch height, they should survive.

Optimum yields require 5 live plants per square foot. If you are short of feed, and there is grass present along with 3 to 5 alfalfa plants per square foot, take at least the first cutting. If the stand is 50 percent or more grass, consider an application of 50 to 75 pounds of nitrogen per acre to increase the grass forage. If many alfalfa plants are damaged but continue to grow, delay the first cutting to 50% bloom or later to allow for recovery.

If you have extensive alfalfa damage, and you will be needing alfalfa in your livestock rations, consider re-seeding alfalfa before you plant corn. Direct seeding of alfalfa using a preplant incorporated herbicide or a post emergent herbicide to control grasses will result in an alfalfa harvest the quickest this season. The first cutting can be taken 60 to 70 days after emergence of the alfalfa. If erosion is a problem, plant a companion crop, such as oats, with the alfalfa. Spray the oats at 3 to 8 inches of height or harvest as oatlage to get an alfalfa yield this year.

Another caution: if destroyed stands are older than two years, do not replant alfalfa here. Alfalfa autotoxicity may occur, killing the new seedlings. If you have no other choice, you can minimize the risk for damage from autotoxicity by the following steps. First, kill the existing top growth with a herbicide. Roundup is the choice if grass is in the mix, or use 2,4-D to kill alfalfa. Use primary tillage to speed up decomposition of the roots. After two weeks, prepare a good seed bed and seed. Consider direct seeding utilizing a grass herbicide to minimize stress.

Other Factors

Even though this spring planting season is off to a late start, there is till potential for a profitable growing season. That potential is based on moisture and temperature after planting and through the growing season.

When the weather and soil conditions allow, farmers will be working long hours. Producers should think safety, take care of themselves, and not take unnecessary safety risks.

*Bob Byrnes, Art Frame, Jim Nesseth, Wayne Schoper
Extension Educators*

Dismal April

Before you become too distraught about losing field working days in the month of April, please consider that from a crop germination and development standpoint, little was lost. Average temperatures in April around the state were from 4 to 6 degrees colder than normal. In fact, for many locations, it was the coldest April since 1975. Less than half the normal number of Growing Degree Days (base 50/86 F) occurred. Normally, many southern Minnesota counties would see from 90 to 120 GDD accumulate in April. With an early planting situation, these GDD can indeed help jumpstart a sown crop. But they didn't occur this year. Many locations only saw 50 to 70 GDD during April of 1995.

A second climatic feature of April worth noting is that soil temperatures remained quite cold, too cold for normal germination rates of small grains. Only recently have soils started to dry out enough that average temperatures at the 4-inch depth have climbed into the upper 40s and low 50s. In fact, the outlook favors a continuation of below normal temperatures around the state for much of early May, with a gradual warming to normal or above normal by May 12-15.

*Mark Seeley
Extension Climatologist*

Ethion uses deleted

FMC Corporation, the basic registrant of ethion, has decided to voluntarily delete all uses except those on citrus from their labels and those of their reformulators. The deletion from FMC's ethion products of all registered uses, except citrus, appeared in the *Federal Register* on 2/24/93 (FR 58 (35): 11234) and on 6/15/94 (FR 59 (114): 30799). The final ethion uses (except on citrus) produced by other registrants of reformulated products are now being deleted. The final uses of ethion on beans, eggplant, peanuts, peppers, pimentos, plums, strawberries, and tomatoes will be deleted on 5/15/95. The final uses of ethion on arborvitae, ash, birch, catalpa, dogwood, oak, poplar, privet, tulip tree, and willow was deleted on 4/24/95. Other uses of ethion are expected to be lost in the near future. FMC Corporation has indicated that it will consider maintaining these registrations if someone else is willing to develop the required data. Dealers and users may distribute, sell, and use existing stocks of ethion labeled with the deleted uses until such stocks are depleted. For additional information contact Ms. Nancy Hilton, FMC Corporation. Phone (215) 299-6753, Fax (215) 299-6256.

Ethoxyquin uses canceled

Wrap Pack plans to voluntarily cancel their product, Apple Wrap, which is the final use of ethoxyquin on apples. The final cancellation of this product will occur, unless withdrawn, on 4/24/95. Ethoxyquin, a fungicide, continues to be registered on pears. Existing stocks of canceled products already in the hands of dealers and users may be distributed, sold, or used legally until they are exhausted. For additional information contact Mr. Steve Altmayer, Wrap Pack. Phone (800) 453-3653, Fax (509) 453-3653.

Deletion of methomyl fly bait uses proposed

DuPont Agricultural Products has requested the deletion of all fly bait uses from their methomyl technical label due to worker exposure concerns. The proposed deletions cover indoor fly bait uses on agricultural premises including animal units, farm buildings, poultry houses, food processing plants, and garbage areas. Unless withdrawn by DuPont, these deletions will become final on 5/5/95. DuPont methomyl technical is formulated by other registrants into fly baits. These product registrations are still active, available, may be used, and will be produced as long as technical products labeled with fly bait uses are in stock. For additional information, contact Dr. Charles Bear, DuPont Agricultural Products. Phone (302) 992-6260, Fax (703) 992-6470. For reregistration information, contact Mr. Philip J. Poli, EPA, Special Review Branch. Phone (703) 308-8038, Fax (703) 308-8041.

Special Local Need Registration

On 12 April 1995, the Minnesota Department of Agriculture issued Special Local Need Registrations for Bravo Zn and Bravo 720 fungicides for use on potatoes to control late blight. The minimum interval between applications is reduced from seven days to five days; the preharvest application interval is seven days; and the maximum amount of active ingredient that can be used is 12 pounds per acre per growing season. Source: John Sierk, Pesticide Registration Advisor, Minnesota Department of Agriculture. Phone (612) 296-4292.

Bh. Subramanyam
Coordinator, Minnesota Pesticide
Impact Assessment Program
Susan Norwood
Research Assistant

Corn

Where? Oh where are the black cutworms?

Nearly 90 cooperators have been watching pheromone traps throughout Minnesota in vain so far. Weather systems that transport black cutworms into the Midwest have largely tracked south of Minnesota over the last three weeks. Only one significant event (>10 moths over two nights) was reported by Glenn Arfstrom near Willmar with 12 moths April 22 and 6 moths on April 23. With the delay in corn planting, cool soils and the abundance of unworked or lightly worked fields, migrations over the next two weeks could still pose a significant threat. We'll keep you posted. Meanwhile, hats off to those diligent black cutworm trappers! It's not easy seeing an empty trap day after day. No matter how good that makes the rest of us feel.

Producers farther south and east aren't so lucky. Marlin Rice, extension entomologist at Iowa State University, told me that nearly every county in the state has had significant captures with the lower two tiers witnessing captures over 20 per two nights. Mike Gray, extension entomologist at the University of Illinois, reports three consecutive weeks of intense captures in a broad band across central Illinois, the heaviest flight he's seen in seven years. With only 5% of the corn planted, cool soils, and weedy fields, the prospects aren't good. George Smith, Missouri IPM Coordinator, also reports the ingredients for severe black cutworm infestations: delayed planting (<5%), early and frequent significant moth flights into the state, and continued cool and rainy weather. Let's count our blessings!

Ken Ostlie
Extension Entomologist

It's Another Banner Year for Common Dandelions

It's another banner year for common dandelions in forage crops. Remember, that common dandelions are perennial weeds. This means that there is a seedling stage that establishes at some point and time which will become perennial within about 4-6 weeks after emergence. Seedling dandelions can be found during the first year of growth in new alfalfa seedings. The other time that dandelions become problematic is when stands start to thin out. We currently think that dandelions do not displace alfalfa but rather, as most weeds do, take advantage of open niches made available to them. This would commonly occur as alfalfa stands start to thin due to disease or winter kill.

There are two opportunities to control dandelions realistically in alfalfa. The first, would be to scout alfalfa fields aggressively in the seeding year. In some cases, dandelion seedlings may be very prominent coestablishing with the new alfalfa seeding. In that case, we have seen fair to good control of dandelion seedlings with labeled products such as Buctril, 2,4-DB, and Pursuit. The caveat is, however, that dandelion seedlings must be, in fact, just that — a seedling. Dandelion seedlings that are about the size of a quarter are reasonably controlled by the broadleaf products labeled for use in alfalfa establishment. Once dandelion seedlings get perennialized, again in a 4-6 weeks time, control drops off dramatically. This is a very narrow window of opportunity to economically control dandelion seedlings that may be coestablishing with your new alfalfa seeding.

The other most likely occurrence is to have established perennial dandelions in established alfalfa stands. Pursuit and 2,4-DB are labeled for use in established alfalfa, but control is poor to fair at best and generally results in stunting rather than kill of dandelion plants. Perennial dandelion plants can be controlled in established alfalfa with the use of metribuzin (Sencor/Lexone) or hexazinone (Velpar). Both Sencor/Lexone or Velpar will cost \$25 to \$35 per acre for product cost

alone, to apply rates that would reasonable suppress common dandelions. Both of these products give fair to good control in established alfalfa, both can cause alfalfa injury, and both are expensive programs.

It is questionable whether the cost can be justified based on the benefits to forage quality. Common dandelion forage quality is generally similar to that of alfalfa. Research in Wisconsin has shown that crude protein for dandelions is similar to alfalfa, or slightly lower than alfalfa when dandelion flower stalks are up. In vitro digestible dry matter is similar to, and occasionally even better than, that of alfalfa. Therefore, maintaining forage quality is not a good reason to invest dollars in control. The only plausible scenario for justifying the expense of dandelion control in established alfalfa would be to reduce the drying time for forage. Work in Wisconsin has shown that common dandelions do dry at a slower rate than alfalfa. An example of the impact this can make is to look at a forage mixture containing 33% common dandelions. With 1/3 of the forage mix as dandelion, forage took approximately one day longer to dry to a moisture suitable for harvest. This can be important in Minnesota and Wisconsin when the window of opportunity for harvesting forage before a rainfall occurs can be minimal. The forage quality lost by rainfall on cut hay can be devastating.

Common dandelions will continue to be another one of our perpetual problems in alfalfa production. The best management opportunity exists in scouting new seedings for perennial weeds such as dandelions, and using more economic control measures before dandelions move from the seedling phase to a perennial plant. Remember, dandelion forage quality is very similar to alfalfa and our current thinking is that dandelions are probably not displacing alfalfa through competition, but rather coexisting and utilizing environmental niches made available to them.

*Roger Becker
Extension Agronomist/Weed Science*

Corn Hybrid Maturities for Late Planting

The wet spring is causing a delay in corn planting. This brings questions about hybrid maturities recommended for later than normal planting dates. Table 1 on page 54 gives corn hybrid maturities that are full season maturities for the various planting dates. For the southern zone of the state, we recommend 110 relative maturity (RM) as full season if planted prior to May 20. After May 20, hybrids with a 110 RM are not maturity adapted — they are not expected to reach normal ma-

turity with a normal temperature season. As indicated in the table, hybrids with 100 RM ratings are full season when planted between May 20 and 25 in the southern zone. Maturities that represent full season hybrids for various planting dates are given in the table for all corn planting areas.

The cool growing seasons of 1992 and 1993 have caused growers to chose hybrids with lower RM ratings than recommended as full season. This will mini-

Corn Hybrid/Continued

mize the need to switch hybrids as the planting is delayed this year. That is, these hybrids have a wider range of calendar dates for planting that will match the remaining growing season.

If planting delays continue and you believe you'll need to change hybrid maturities, contact your seed dealers now so you can buy the best yielding hybrids.

Dale Hicks
Extension Agronomist

Table 1. Minnesota relative maturity ratings that represent "full-season" corn hybrids for May planting dates.

Zone	If Planting Occurs By:				
	Prior to May 20	May 25	June 1	June 10	June 20
	----- Relative Maturity -----				
Central	95-100	90	85	80	
South Central	100-105	95	90	85	75
Southern	105-110	100	95	90	80

ALFALFA

Alfalfa Weevil— Relatively cool, yet normal spring weather prevailed this past week, resulting in minimal accumulations in weevil degree-days (DDs) (or useable heat units by the weevil for development, above its developmental threshold of 48°F). The table below summarizes the DDs as of May 1, 1995 for several Minnesota locations. Although the alfalfa is not taking off at record speeds, so far, the DDs shown below for the 30yr historical average (e.g., Rosemount and Waseca), show that the temperature accumulations to date are close to normal. Because alfalfa has a lower developmental threshold than the weevil, it will initiate growth sooner than the weevil each spring. For this reason, cool springs tend to favor alfalfa growth over that of the weevil, resulting in the typical scenario of alfalfa reaching harvest maturity before damaging larval populations (late instars) are present.

Again, scouting for alfalfa weevil is not necessary until about 300 DDs, but, where possible, it is still a good idea to be out checking fields for other insects, diseases, and the general health of established stands. For ex-

ample, if severe winter kill has occurred, or pest problems have contributed to stand loss over the winter, decisions need to be made now about terminating a stand, rotating to other crops and establishing new stands.

Bill Hutchison
Extension Entomologist

Cumulative Degree-Days for Alfalfa Weevil (>48°F) in Minnesota (as of May 1, 1995)**

Alexandria	- 33	Olivia	- 62
Cambridge	- 44	Rosemount	- 81
Faribault	- 63	St. Cloud	- 55
Mankato	- 81	Waseca	- 76
Morris	- 37	Winona	- 76
Rochester	- 62		
Rosemount (30 yr. historical avg.) = 53			
Waseca (30 yr. avg. = 72)			

** Estimates based on double sine-wave method. Data provided by Dave Bartels, M.S., Department of Entomology, University of Minnesota.

DIAL U

Dial U is a user-fee telephone diagnostic clinic for calls and samples related to gardening, landscapes, plant diseases, insects, and wildlife associated with the home environment. Calls from the public are taken at 1-900-988-0500 weekdays. A flat \$2.99 charge is billed automatically to the phone from which the call is placed.

Controlling Moss in the Lawn

Many people have called Dial U this spring to ask about controlling moss in their lawns. Most had pretty shady yards, but some had mostly sun. And in some cases, the moss had started in the shade, but spread fairly significantly over the past few years into sunnier locations.

For starters, moss **IS** much better adapted to growth in shade than grasses are. Even the "shade-tolerant" mixes will not thrive in anything like dense shade, so moss can out-compete them. But shade is not the only contributing factor to an abundance of moss in the lawn.

Moss needs plenty of moisture. It often grows well where soil is compacted, with lots of moisture at the surface when it's watered or it rains. Compact soils simply don't drain well. Moss may also indicate nutrient-poor soil conditions. And though it's traditionally associated with acidic soils, in Minnesota this is far less likely to be an important contributing factor.

You can rake moss out of a lawn with a heavy metal garden rake. (It sits right up at the soil surface and is not deeply rooted.) However, you must be able to get something else established in its place, or **the moss or some other weed will come back**. To do this usually means correcting the conditions that favored moss in the first place.

Trim trees to let in more light, if possible. Begin a program of regular fertilization (and watering when necessary). Core aerate the soil if it's compact. You could do it once now, then again in fall. If soil is badly compacted, an annual fall aeration (mid-September or so) will prove beneficial. Overseed thin areas of lawn with the appropriate grass mix.

If your site is extremely shady, don't attempt to grow grass. Instead, look for shade-tolerant ground covers (if you don't need to walk in that area) or spread wood chips on the ground (if you do need to maintain foot traffic in those shady sites). Or, do as the Japanese; learn to love the moss!

*Deborah Brown
Extension Horticulturist*

"Carpenter ants"...

... has been our most common call. Although in many cases it is unclear where they are nesting, the first step in carpenter ant pest management is to determine where the nest is.

The first appearance of carpenter ants can be a guide. If ants were seen when the weather first becomes warm, they are probably nesting in or very near the house. If it is well into the warm season before you see any ants, then they may be entering from an outdoor nest.

You can detect indoor nests by checking for the presence of sawdust, large numbers of ants (20 or more), water-damaged wood (where carpenter ants like to nest) or a swarm of winged ants. If you found carpenter ants in homes during winter, this also indicates an indoor nest.

If you're still not sure, try following them to their nest during evening or at night (between 8:00 p.m. and 4:00 a.m.) when carpenter ants are most active. You can also try putting out some food that they'll like (e.g. chopped up insects) and then try to follow them back to their nest.

If a nest is found indoors, a home dweller can treat it by applying an insecticidal dust containing bendiocarb, chlorpyrifos, or boric acid directly into it. If the nest is found outside or a satellite nest is present in the home, you can apply a perimeter treatment around the building's exterior using chlorpyrifos or diazinon to keep ants out.

Prune any branches that are in contact with the building so carpenter ants cannot circumvent the treatment (**Caution:** do not prune oak between April 15 and July 1; do not prune elm between April 15 and September 1 in southern Minnesota and between April 15 and July 15 in northern Minnesota).

If it is not clear where the ants are coming from, continue to monitor them until you can better determine their nesting site(s). Carpenter ant damage is slow in most cases, and you can afford to take time to determine where they are.

Carpenter ant control is often difficult and challenging. Many times the experience of a pest control operator (PCO) makes it more practical for a professional to be hired to deal with carpenter ants. See FO-1015, *Carpenter Ants*.

*Jeffrey Hahn
Asst. Extension Entomologist*

Apple Diseases — Time to Act if You Plan To Include Fungicides in Your Management Plan

Depending on the weather in your part of the state, it may be time to spray your apple trees for apple scab and cedar apple rust. If cedar apple rust has been a problem in the past, a fungicide with the active ingredient triforine or ferbam should be applied at about 1/2 inch green tip (green leaves are out of the buds about 1/2 inch) or watch local junipers for the presence of orange gelatinous tendrils exuding from small brown galls on branches following rainy periods. These orange tendrils contain the spores which will infect the apple trees; spray when you see them.

If apple scab is your big concern, the first application of a fungicide such as captan should be applied before the blossoms open. Don't forget to follow up with 3-4 additional sprays to protect the foliage this spring. Summer applications can be made but are usually not necessary in home grown fruits.

*Cynthia Ash
Asst. Extension Plant Pathologist*

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CROP

NEWS

From the UNIVERSITY OF MINNESOTA
Crops System Team
of the
Minnesota Extension Service

Alfalfa — Insect Pest Management

Alfalfa Weevil — As in recent years, I will be providing weekly updates on the progress of our Minnesota spring... at least as it relates to alfalfa weevil development. Weevil populations (i.e., larval activity) are not usually detectable in Minnesota until we have accumulated 300-400 degree-days (DDs). At this time young first instar larvae that have hatched from spring-laid eggs can be found feeding in the terminal leaves of stems. I should point out that researchers at Iowa State University have reported some survival of fall-laid weevil eggs in recent years, and have therefore recommended scouting at 250 DDs to pick up larvae that are hatching earlier from these eggs. However, we presently have no evidence for any recent increase in the survivability of fall-laid eggs in Minnesota. As shown below, and expected by the cool, balmy weather this year, most sites in Minnesota are showing only minimal DD accumulations to date.

*Cumulative Degree-Day Estimates for Alfalfa Weevil (>48°F) in Minnesota (as of April 24, 1995)***

Alexandria - 25	Olivia - 44
Cambridge - 31	Rosemount - 57
Mankato - 59	St. Cloud - 41
Hutchinson - 42	Waseca - 56
Morris - 27	Winona - 59
Rochester - 48	

** Estimates are based on the sine-wave method. Retrieval and degree-day estimates provided by Dave Bartels, M.S., Department of Entomology, University of Minnesota.

AW larvae are only about 1/16 inch when they hatch, and more pale yellow, turning green as they mature. Older larvae are green with a white stripe down their back, with a dark-brown to black headcapsule. The adults, which may be seen in sweep-net samples, are brown, and about 1/4 inch in length.

Most of the feeding damage (approx. 90%) is done during the last two larval instars. In most years, this damage does not occur until approximately 500-600 DDs, and our economic (or action) thresholds are based on the activity of these later instars.

Highlights...April 28, 1995

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What if CRP Ends?*

*Anhydrous Ammonia Before Planting
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*Soybean White Mold or Sclerotinia Stem
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Dial U

*Time to Enjoy Cedar Apple Rust on
Juniper*

*Use Pre-emergent Herbicide to Prevent
Crabgrass and Other Annual Weeds
in the Lawn*

*Sowbugs and Millipedes
Vegetable Pest Management Guide*

Alfalfa/Continued

A variety of action/economic thresholds are available; all are based on stem sampling; e.g. 40-50 stems taken at random across a field (usually a Z or circular pattern). The simplest action thresholds include the use of 40% of the stems having obvious tip feeding damage OR an average of 2 or more larvae (late-instar)/stem. During the first spring growth cycle, however, if these infestations are not detected until the crop is about ready to be harvested (e.g., within 5-7 days), then we recommend no insecticide use, and proceed with cutting the field. A more accurate economic threshold, which accounts for the expected value of the alfalfa and cost of insecticide, has recently been developed at Nebraska (Robert Peterson, Steve Danielson and Leon Higley). **Table 1** summarizes the number of larvae/stem that a field should average before insecticide treatment is justified. For example, if the cost of control is \$11.00/ac and the forage value is \$85.00/ton, then the field should average 3.4 larvae/stem. Alternatively, if the alfalfa is only worth \$45.00/ac, for the same control costs, you would need to have 6.3 larvae/stem.

Most insecticides labelled for alfalfa weevil in Minnesota are shown in **Table 2**. Please note for the

Table 1. Economic thresholds for alfalfa weevil larvae in early bud stage alfalfa.

Control Cost \$ per acre	Forage Value (\$ per ton)							
	45	55	65	75	85	95	105	115
7	4.0	3.3	2.8	2.4	2.2	1.9	1.8	1.6
8	4.6	3.6	3.2	2.7	2.4	2.2	2.0	1.8
9	5.2	4.2	3.6	3.1	2.7	2.5	2.2	2.0
10	5.8	4.7	4.0	3.4	3.0	2.7	2.5	2.2
11	6.3	5.2	4.4	3.8	3.4	3.0	2.7	2.5
12	6.9	5.6	4.8	4.2	3.7	3.3	3.0	2.7
13	7.4	6.1	5.2	4.5	3.9	3.5	3.2	2.9

Table 2. Insecticides labeled for alfalfa weevil.

Insecticide	Rate Per Acre	Harvest Interval
Ambush 2E	6.4-12.8 ounces	0-14 days
Furadan 4F	0.5-2 pints	7-28 days
Lannate LV	3 pints	0 days
Lorsban 4E	1-2 pints	14-21 days
PennCap-M	2-3 pints	15 days
Pounce 3.2 EC	4-8 ounces	0-14 days
Sevin XLR+	3 pints	7 days

permethrin products (Ambush and Pounce), only the higher rates should be used for alfalfa weevil. With all materials, be sure to check the pre-harvest interval. Also refer to the 1995 publication, BU-500, *Insecticide Suggestions to Control Insect Pests of Field Crops*, which is revised annually and includes economic thresholds for major insect pests of all field crops in Minnesota (contact county offices or call the MES Distribution Center: 612-625-8173).

Finally, as in previous years, because of typically cool/mild springs, the most likely time that weevil infestations often cause the most damage (in Minnesota) is to the new regrowth developing after the first cutting. This can be a concern regardless of when the alfalfa was cut. If a significant weevil infestation was present prior to cutting and early-cutting was used as a management tool, the regrowth of the field should still be checked to be sure that the regrowth is greening up normally (i.e., within 5-6 days, assuming adequate moisture, lack of other pest problems). If these fields are not greening up, and obvious feeding damage is present, and/or 6 or more larvae/ft² are present, then an insecticide application may be needed at this time. I will have more details in future newsletters regarding the economic threshold on stubble alfalfa.

Bill Hutchison
Extension Entomologist

What if CRP Ends?

It's possible that the ten-year Conservation Reserve Program (CRP) might end in the next few years, or at least might be greatly scaled back. This program provided cash payments to owners of land prone to erosion who stopped growing crops and planted grass or some other soil-conserving cover on the land. Over the last seven to ten years, much of this land has developed a heavy biomass cover and high populations

of wildlife. In some cases, the biomass includes undesirable weeds and brush, and the wildlife includes pocket gophers, which have created a very rough surface.

If CRP ends, many contract holders will no longer receive rental payments from the government and they will be looking for new uses for the land. Options are numerous, but could include taking the land

out of grass and planting a conventional crop, planting trees, or leaving the land in grass and:

- ✓ just leaving it idle without any compensation;
- ✓ finding some other conservation program that would provide rental payment;
- ✓ raising ruminant animals;
- ✓ establishing fee hunting; or
- ✓ harvesting biomass for energy or hay.

Many organizations are interested in working with contract holders whose contracts are about to expire. The organizations first want to make sure contract holders are aware of all the options and then provide assistance as the options are carried out. In preparing to work with CRP contract holders, several organizations are conducting surveys, planning and conducting research on CRP land, and developing decision aids and informational fact sheets. A workshop was held on the St. Paul Campus of the University of Minnesota March 3, 1995 to bring some of these groups together to exchange information and try to plot some strategy for coordinating work and avoiding duplication of effort.

One outcome of the March 3 workshop was a recommendation that a team be organized "to establish an information clearing house and coordinate research, demonstration, and educational activities." A team has been formed and it has met once. Team membership is likely to be flexible, but currently includes:

- ✓ Board of Water & Soil Resources (BWSR)
- ✓ Consolidated Farm Services Agency (CFSA)
- ✓ Land Stewardship Project (LSP)
- ✓ Minnesota Agricultural Experiment Station, University of Minnesota (MAES)
- ✓ Minnesota Corn Growers Association (MCGA)
- ✓ Minnesota Department of Agriculture (MDA)
- ✓ Minnesota Department of Natural Resources (DNR)
- ✓ Minnesota Extension Service, University of Minnesota (MES)
- ✓ Minnesota Institute for Sustainable Agriculture (MISA)
- ✓ Natural Resources Conservation Service (NRCS)
- ✓ Pheasants Forever (PF)
- ✓ Sustainable Farming Association (SFA)

At its first meeting, the team agreed to increase the exchange of information among members and discussed ways to improve communication with each other and with contract holders. The team will be meeting approximately once a month for the next year or so. If you have questions or suggestions for the team, contact Barbara Weisman at MDA (612-282-6831) or Bill Wilcke at MES (612-625-8205).

Bill Wilcke
Extension Ag Engineer

Anhydrous Ammonia Before Planting

The late spring of 1995 has raised questions about time delays between the application of anhydrous ammonia and corn planting. Unfortunately, there are no firm guidelines for this waiting period.

After application, anhydrous ammonia usually moves to a distance of 3 to 6 inches from the injection point. The anhydrous gas is absorbed by soil moisture and converted to the ammonium form of nitrogen. The movement is reduced if soil moisture is high, as it is this spring. Then the nitrogen is more concentrated and can damage young seedlings. The

high concentration of nitrogen can also be the result of sealing of the sides of the slot in the soil created by the anhydrous knife. This sealing prevents movement (diffusion) of anhydrous ammonia away from the point of injection.

The best plan for eliminating damage to seed if soils are wet is to switch from preplant to sidedress applications. Waiting may not eliminate problems if the seed is placed too close to the zone of ammonia application.

George Rehm
Extension Soil Scientist

Time to Fertilize Pastures

Pastures are an important component of many farm enterprises in Minnesota. Fertilizer management is important for this crop; but, it is frequently neglected when thoughts turn to production of grain crops.

Pasture fertilization programs are not complicated. Emphasis is placed on adequate, but not excessive amounts of nitrogen, phosphate, and potash. Phosphate and potash needs are easily based on the results of a soil test.

Nitrogen suggestions are adjusted for management situations. With adequate rainfall and rotational grazing, a rate of 150 pounds of nitrogen per acre is suggested. Split application is sug-

gested with about 2/3 of the amount applied in the spring and 1/2 applied in August. Without rotational grazing, the suggested nitrogen can be reduced to 100 pounds per acre.

For sandy soils and situations where nitrogen is limiting, the suggested rate of nitrogen is 30-50 pounds per acre. The nitrogen should be applied in the spring for these situations.

All potash and phosphate fertilizers should be applied in the spring.

*George Rehm
Extension Soil Scientist*

Soybean White Mold or Sclerotinia Stem Rot

This disease, while not new, has taken on increased or new interest. It clearly is a greater problem in high yield environments. Early planted, narrow rows and high plant populations in reduced tillage sites are reported to favor the infection of soybean plants. Infection is dependent on blossom colonization first, then the fungus progresses into the node or stem. At infection of the blossom (and even before the infection), inoculum production and fungal sclerotia germination appear to be very environment-dependent.

It is unclear what constitutes a favorable environment, but temperature and moisture are considered major players. The infection court (plant pathology jargon which means the location where the fungus begins the infection process), may be less receptive or more receptive to infection by *Sclerotinia* if other organisms are or are not present in the infection court.

A recent report on dry edible beans says that bacteria can function as an antagonist and prevent "White Mold" infection. The study reported that the inhibition of fungal infection occurred only when

the bacteria were in the rapid growth phase. However, when the blossoms are inoculated simultaneously, none of the bacteria were able to reduce ascospore-fungal infection or lesion development.

It was further reported that optimum bacterial growth and development only occurred at anthesis (full flower). Blossoms inoculated either early in development or in early senescence failed to have a bacterial growth.

Temperature does appear to be a factor—at 30° C (86° F) rapid bacterial growth was recorded, but at 22° C (72° F) and at 14° C (57° F) bacterial growth was greatly reduced and less antagonism was recorded. Canopy temperature of 20° C (68° F) results in limited bacterial growth and significantly more lesion development than if the canopy temperature is 28° C (82° F). Lesion development was also limited at 24° C (75° F). Field testing this concept resulted in less than predicted disease management.

*Ward C. Stienstra
Extension Plant Pathologist*

Winter Kill of Alfalfa is Potentially Severe

Severe winter kill of alfalfa has been observed at Rosemount and Waseca, Minnesota. As expected kill has resulted from three different problems this winter: 1) plant death from exposure to excessively low temperatures, 2) death from ice sheets, and 3) death from freezing regrowth initiated in late March.

For the first two cases plants are dead. Plants can be easily pulled from the soil because the root is under rapid decay. In the third case, on some plants the new growth initiated in late March has completely desiccated. However, some plants have new shoot growth intact and actively growing. Root tissue may

or may not be showing signs of decay. If these plants have solid white roots without decay and growth coming from the crown they could be alive and may regenerate into fully active plants. Time is needed to determine if they will make it. If the plant continues to grow through six-inch plant height it should survive.

Optimum yields may occur with 5 live plants per square foot. If feed supplies are short and grasses are present, 3 to 5 plants per square foot will be adequate short term stands to keep for at least the first cutting this year. Stands with 50 percent or more grass in the stand will respond economically to an application of 50 to 75 pounds per acre of actual Nitrogen fertilizer. Plants injured from winter conditions should be harvested later on the first cut (50% bloom or later) to allow for recovery.

Plant new alfalfa before corn if you have extensive damage. Direct seeding alfalfa using a preplant incorporated herbicide or a post emergent herbicide to control annual grasses will result in alfalfa the quickest this season. First cutting should be taken 60 to 70 days after emergence of alfalfa (often mid

to late June). For sloping fields susceptible to water erosion, planting alfalfa with a companion crop is recommended. Choosing oats as the companion crop then spraying out the oats at 3 to 8-inch height of oats will result in alfalfa as quickly as direct seeding would. Also, seeding with a companion crop and harvesting at boot stage of the companion crop will result in early forage and least risk establishment management.

If lost stands are older than 2 years old, manage for autotoxicity of alfalfa. The best choice is to alternate to another crop. If you want to go back to alfalfa, the following steps are recommended to minimize risk for damage from autotoxicity. Kill existing top growth with an herbicide (Roundup if you have perennial grasses otherwise 2,4 D 1 quart or less per acre of 4 pound per gallon product will kill alfalfa). Use primary tillage to speed decomposition of the old roots. After two weeks, prepare a good seed bed and seed. Minimize stress during establishment with direct seeding with a grass herbicide.

Neal P. Martin
Extension Agronomist — Forages

1995 Ag Professional Field School

The 1995 Ag Professional Field School is scheduled for July 11 and 12 at the Northwest Experiment Station at Crookston. This hands-on crop management field school will emphasize small grains, sugarbeets, sunflower, drybean and potato production. Over six acres of demonstration plots have been designed specifically for this program. Participants will enhance their troubleshooting and crop management skills with hands-on experience of actual cropping situations. Led by experienced instructors from the University of Minnesota, North Dakota State University and industry, the program offers small group activities and personalized instruction.

Who Should Attend:

The program is designed for agricultural professionals involved with crop management in northwest and westcentral Minnesota, and eastern North Dakota. This includes agriculture product dealers, crop consultants, extension educators and agency personnel.

Date, Time and Location:

Check-in time will be between 7:30 a.m. and 8:15 a.m. on Tuesday, July 11, at the Ag Research Center on the U of M Crookston Campus. The program

will begin promptly at 8:15 a.m. and last until 5:30 p.m. The program will begin again at 8:00 a.m. and finish at 4:30 p.m. on Wednesday.

Registration and Cost:

Tuition is \$185.00 per person until June 30. After June 30, the tuition is \$210.00. This fee includes reference materials, two noon meals and break refreshments. Lodging and evening meals are not included. Make checks payable to the University of Minnesota and mail to:

Ag Professional Field School, Registrar
P.O. Box 64780
St. Paul, MN 55164-0780

Please contact Kelly Fisher at 1-800-367-5363, FAX (612) 625-2207 for additional registration information. For program content information, please contact Bev Durgan (612) 625-7262 or Mike Schmitt (612) 625-7017.

Beverly R. Durgan
Extension Weed Scientist

Dial U is a user-fee telephone diagnostic clinic for calls and samples related to gardening, landscapes, plant diseases, insects and wildlife associated with the home environment. Calls from the public are taken at 1-900-988-0500 weekdays. A flat \$2.99 charge is billed automatically to the phone from which the call is placed.

Time to Enjoy Cedar Apple Rust on Juniper

Now is the time to keep a close eye on your junipers (eastern red cedar), especially if they have small brown galls 1/4 to 1 inch in diameter. With spring rain these galls ooze out bright orange gelatinous tendrils often an inch or more in length. If you have apple trees or their relatives (mountain ash, hawthorn, juneberry) nearby, the enjoyment may be cut short by the knowledge that within those orange tendrils are spores capable of germinating and infecting your apple leaves and fruits. But even these infections can be enjoyed because of the bright yellow to orange to pink lesions that form and the showy little tubes which form on the bottom side of the lesion. Out of these cute little tubes fall spores which are blown back to the juniper to set about the business of starting new galls.

Should you choose not to enjoy this lovely fungus in its association with your juniper or apple, here's what you can do. Remove all galls from junipers in the area before they ooze tendrils. Apply fungicides to apple type hosts when the orange tendrils are forming. Choose one with one of these active ingredients: chlorothalonil, mancozeb, triforine or triadimefon; check the label to confirm that the fungicide you choose can be used on the plant you wish to spray. Applications will need to be repeated three times at ten day intervals.

Cynthia Ash
Asst. Extension Plant Pathologist

Use Pre-emergent Herbicide to Prevent Crabgrass and Other Annual Weeds in the Lawn

It's best to apply—and water in—pre-emergent herbicide about two weeks before you anticipate crabgrass germination. In the Twin Cities area that means applying it the first or second week of May. You probably should go with the first week in the southernmost part of the state. Wait until the third week of May if you live a hundred miles north of the Metro area (if you have problems with crabgrass at all).

Crabgrass sprouts first in warm locations such as south-facing slopes and adjacent to concrete curbs and sidewalks or asphalt driveways. It also pops up early in gardens, where dark soil absorbs the sun's heat. Just because crabgrass is beginning to show up in "hot spots" it doesn't mean it's too late to use a pre-emergent product on your lawn.

Not all crabgrass seeds sprout at once; they continue to germinate throughout much of the summer. You may miss some if you're a little late applying the herbicide, but you can still control lots of seed. Liquid "crabicides" are not usually recommended as they're most effective when plants are very small. And crabgrass is usually not noticed in the lawn until it's grown quite large.

Spread pre-emergent herbicide only where you've had crabgrass problems before. It's not necessary to spread it over the entire lawn. If you're overseeding this spring, you must choose a product labelled specially for use in newly seeded lawns. These products will contain the active ingredient "Siduron" or "Tupersan." All others will stop desirable grasses right along with the weedy ones.

It's too early to go after dandelions, creeping charlie and other broadleaf weeds—unless, of course, you plan to pull or dig them out. In general, early autumn is a much better time to target broadleaf weeds.

Deborah Brown
Extension Horticulturist

Sowbugs and millipedes have been common in homes lately. Sowbugs are about 3/4 inch long, dark-colored, and resemble little turtles or armadillos. Millipedes are one inch long, dark-colored and worm-like. Both are relatives of insects.

Sowbugs and millipedes found in homes this spring most likely came from cracks and crevices within the building where they spent the winter. As they become active they usually find themselves trapped indoors instead of getting outside. Despite the circumstantial evidence, they do not breed in buildings but are simply survivors from last fall.

These arthropods may also take refuge in homes during heavy rains. As water levels get too high, they move away from it and can accidentally enter buildings.

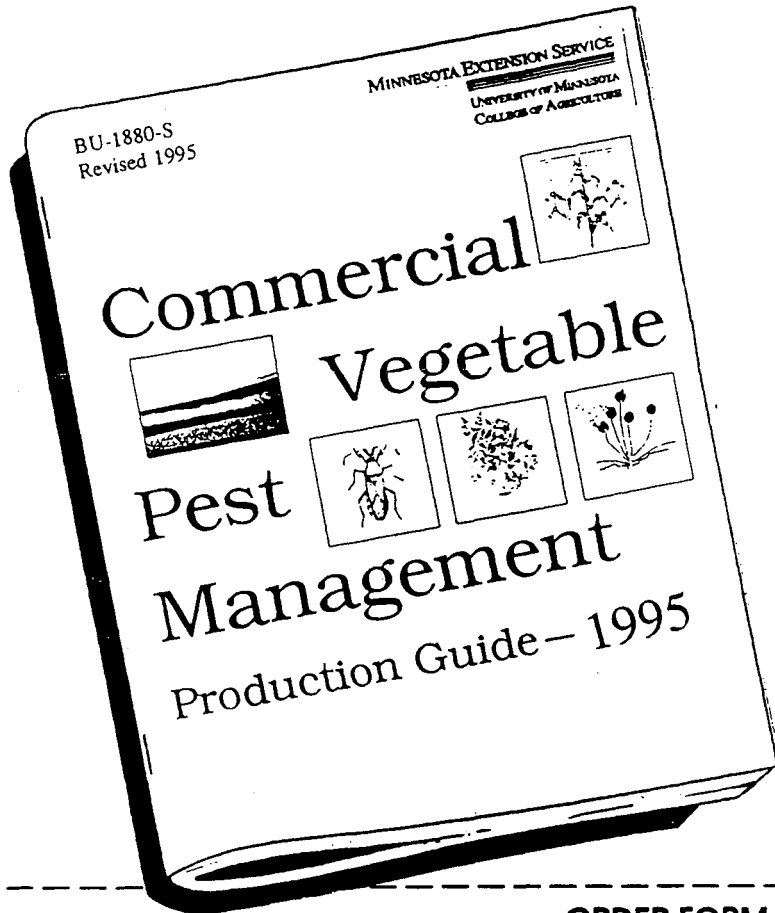
Sowbugs and millipedes are harmless and do not survive more than a few days indoors before they die on their own. Physically removing them is the only necessary control. Insecticides are not suggested because sowbugs and millipedes are short-lived and it does not prevent more from appearing in homes.

This is a temporary problem that does not last beyond spring. Either the sowbugs and millipedes get outside or they die indoors. See FS-1023, *Sowbugs, Millipedes, and Centipedes in the Home*.

Jeffrey Hahn
Asst. Extension Entomologist

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